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216 PATERSON PLANK ROAD SITE
CARLSTADT, NEW JERSEY

FOCUSED FEASIBILITY STUDY
INVESTIGATION REPORT

Prepared for:

The 216 Paterson Plank Road Cooperating PRP Group

Prepared by:

Golder Associates Inc.
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Mt. Laurel, New Jersey

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November 1997

Project No.: 943-6222

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November 21, 1997

Project No.: 943-6222

Chief, New Jersey Compliance Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency, Region II
290 Broadway
New York, NY 10007-1866

Attn.: Mr. Jon Gorin, Remedial Project Manager

RE: 216 PATERSON PLANK ROAD, CARLSTADT, NJ
FOCUSED FEASIBILITY STUDY INVESTIGATION REPORT

Gentlemen:

On behalf of the 216 Paterson Plank Road Cooperating PRP Group (Group), we enclose four copies of the above Report which has been prepared pursuant to the Work Plan approved by USEPA in a letter dated June 23, 1997. Three copies have also been provided to the New Jersey Department of Environmental Protection under separate cover.

As discussed, the investigation confirmed the presence of a sludge "hot spot" and the Report includes a recommendation that a treatability study, focusing on in-situ remediation technologies, be conducted on this material. The Group intends to develop a work scope for this study which will be submitted for your review in due course.

If any questions arise during your review of the enclosed report, please do not hesitate to contact me.

Very truly yours,

GOLDER ASSOCIATES INC.

P. Stephen Finn, C.Eng.
Facility Coordinator

cc: Chief, Bureau of Federal Case Management
N.J. Department of Environmental Protection
Attn: Riché Outlaw, Case Manager

Warren L. Warren, Esq., Drinker, Biddle & Reath
Cooperating PRP Group Technical Committee

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EXECUTIVE SUMMARY

This Focused Feasibility Study Investigation Report (Report) is submitted on behalf of the 216 Paterson Plank Road Cooperating PRP Group. The Report presents the methodologies used and the data collected during the investigation conducted pursuant to the Final Focused Feasibility Study Investigation Work Plan (Investigation Work Plan) for the First Operable Unit (FOU) fill at the 216 Paterson Plank Road Site (Site) in Carlstadt, New Jersey approved by USEPA on June 23, 1997.

The primary purpose of the Focused Feasibility Study Investigation (FFSI) was to gather data on the nature and extent of a potential sludge "hot-spot" area. The project objective was accomplished using a combination of geophysical survey techniques and a soil boring and sampling program. The geophysical survey was used to assess the approximate location and boundary of the potential sludge "hot-spot" area and to focus the subsequent soil boring program. The soil boring program defined the physical nature and extent of the sludge "hot-spot" area. Samples were also collected during the boring program and submitted to separate laboratories for chemical and geotechnical analyses.

The Investigation confirmed the presence of a discrete area of sludge that may be considered as a "hot-spot". In summary, the data collected indicates the following:

- The sludge "hot-spot" area as defined by its physical properties, is approximately 4,000 ft^2 in areal extent and consists predominately of sludge material and fine grained soil with little debris. Assuming an average thickness of 10 feet, this equates to a volume of approximately 1,480 cubic yards.
- The chemical characteristics of the sludge "hot-spot" include the highest volatile organic compounds (VOC) and polychlorinated biphenyl (PCB) concentrations detected anywhere on-Site.

Excavation of the materials within the sludge "hot-spot" area would be extremely difficult given the physical constraints (e.g., slope stability) and the chemical characteristics of the material to be excavated (e.g., extremely high levels of VOCs present in the material). As discussed in detail in the Investigation Work Plan, the implementation difficulties and risks associated with the sludge "hot-spot" excavation and handling at the Site are such that in-situ remedial alternatives warrant serious consideration in the Focused Feasibility Study.

In order to explore the feasibility of in-situ treatment options, additional treatability study work is necessary. A work plan addressing the required scope of work and number of samples that will be collected will be submitted for USEPA approval. It should be noted that the schedule outlined in the Investigation Work Plan included an optional item for treatability studies, should this be necessary based on data collected during this FFSI.

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1.0 INTRODUCTION

On behalf of the 216 Paterson Plank Road Cooperating PRP Group (Group), Golder Associates Inc. (Golder Associates) has prepared this Focused Feasibility Investigation Report (Report) for the Focused Feasibility Study Investigation (FFSI) of the First Operable Unit (FOU) fill at the 216 Paterson Plank Road Site (Site) in Carlstadt, New Jersey (Figure 1). This report presents the methodologies used and the data collected during investigations conducted pursuant to the Final Focused Feasibility Study Investigation Work Plan (Investigation Work Plan) dated May 1997 and approved on June 23, 1997. This Report is submitted in partial fulfillment of the reporting requirements set forth in the FFS Work Plan (Golder Associates, 1995). Administratively, the work is being conducted pursuant to the additional work provisions of an Administrative Order on Consent (Index No. CERCLA II-50114) dated September 30, 1985 (RI/FS Order).

1.1 Background

The 6-acre Site is a former chemical recycling and waste processing facility, which ceased operation in 1980 and was placed on USEPA's National Priorities List (NPL) in 1983. A remedial Investigation was initiated in 1987 leading to a USEPA Record of Decision (ROD) in 1990. Interim Remedial Measures, pursuant to the ROD, were completed in 1992 for the FOU fill zone. A Focused Feasibility Study (FFS) was initiated at the request of USEPA to provide a basis for selection of a final remedy for the FOU. The FFS is being conducted in accordance with an approved FFS Work Plan (Golder Associates, 1995) which also addresses investigation of the deeper groundwater in the vicinity of the Site as part of a separate Off-Property Investigation.

In accordance with the FFS Work Plan, Golder Associates completed Phase I of the FFS, Development of Remedial Alternatives. On January 25, 1996, Group representatives and Golder Associates met with USEPA and presented the Phase I results that included a summary of existing data, recommended remedial alternatives for consideration in Phase II of the FFS (Detailed Evaluation of Alternatives), and data gaps required to be filled to complete the detailed evaluation.

Phase I of the FFS identified a number of severe limitations and complex issues associated with ex-situ remedial options as a result of the large amount of construction and demolition (C&D) debris contained within the FOU fill and health and safety risks to construction workers and nearby receptors. The limitations associated with ex-situ remedial alternatives for the FOU were discussed

in detail in the Investigation Work Plan which concluded that Site-wide ex-situ treatment alternatives be eliminated from further consideration in the FFS. In addition, potential "hot-spot" areas were to be considered; the FFS Work Plan defined a "hot-spot" to be:

- an area where, if the chemical constituents are removed and/or treated, the Site-wide risk would be reduced by over an order of magnitude; and,
- an area small enough to be considered separately from remediation of the entire FOU.

Phase I of the FFS identified that "sludge" in the vicinity of the RI boring B-1 potentially fits this working definition of a "hot-spot." The sludge previously observed was a fine-grained material with a grease-like consistency which offered very little penetration resistance during drilling and was relatively free of debris. The highest concentrations of PCBs on the Site and elevated VOC concentrations were also associated with this material. As a result, remediation of the sludge constituents detected in the B-1 boring would yield almost a two order of magnitude reduction of direct contact risk. It was also noted that boring B-1 was located in the eastern portion of the Site in the vicinity of two former ponds.

The USEPA requested that the Group complete a work plan to address data gaps presented at the January 25, 1996 meeting. These data gaps include:

1. further define the potential sludge "hot-spot" area in the vicinity of boring B-1;
2. verify the geotechnical properties of the soils directly underlying the FOU; and,
3. evaluate the need for possible future treatability study/pilot work on remedial technologies for the "hot-spot" area based on the results of the FFSI.

This request led to the development of the Investigation Work Plan (Golder Associates, 1997) and implementation of the FFSI work presented in this report.

1.2 Project Objective

The primary objective of the FFSI was to gather data necessary for the evaluation of remedial alternatives in a sludge "hot-spot" area. This, in turn, entails determining the nature and extent of the sludge "hot-spot" area and its chemical characteristics, together with the geotechnical properties of the natural materials underlying the sludge "hot-spot." Based on these results, the need for

treatability studies in the sludge "hot-spot" area can be evaluated. The project objective was accomplished using a combination of geophysical survey techniques and a soil boring and sampling program. The geophysical survey was used to assess the approximate location and boundary of the potential sludge "hot-spot" area and to focus the subsequent soil boring program. The soil boring program was used to define the nature and extent of the sludge "hot-spot" area. Samples were collected during the boring program and submitted to separate laboratories for chemical and geotechnical analyses.

This Report includes the following key elements:

- Section 2 describes the Investigation procedures including the surface geophysical survey and the soil boring program;
- Section 3 discusses the results of the surface geophysical survey, describes the subsurface materials encountered during the drilling program, and discusses the soil analytical and geotechnical results; and,
- Section 4 presents the conclusions and provides recommendations for future investigations at the Site.

2.0 FOCUSED FEASIBILITY STUDY INVESTIGATION FIELD WORK

2.1 Overview of the Field Investigation

The FFSI included the following:

1. Geophysical Survey: in the area of RI boring location B-1 and the two former ponds;
2. Soil Boring Program: to define characteristics (areal extent, subsurface material types, and chemical constituent concentrations) in the vicinity of the potential sludge "hot-spot" area at location B-1 and other potential sludge areas within the two former sites as identified during the geophysical survey;
3. Geotechnical Sample Collection and Analysis: to provide geotechnical parameters for the meadow mat layer and upper glaciolacustrine varved unit below the potential sludge "hot-spot" area.

Field activities commenced on July 8, 1997, with the geophysical survey, and the on-Site boring program was completed on August 18, 1997. The geophysical survey was performed by Golder Associates and drilling services were provided by Aquifer Drilling & Testing - MidAtlanic, Inc. of Trenton, New Jersey. Laboratory services were provided by CompuChem Environmental of Durham, North Carolina, Accutest of Dayton, New Jersey, Accredited Laboratories of Carteret, New Jersey, and the Golder Associates soils laboratory (geotechnical analysis) in Mt. Laurel, New Jersey. Surveying services were provided by GEOD Corporation of Newfoundland, New Jersey

2.2 Surface Geophysical Survey Program

The surface geophysical testing commenced on July 8, 1997 and was completed on July 11, 1997. Details of the procedures and results are presented in Appendix A and results are summarized in Section 3.0. Geophysics was used to assist in determining the approximate extent of areas containing sludge material and/or large debris. The data collected from the geophysical survey was then used to guide the placement of borings for the Soil Boring Program in the B-1 and former pond areas.

In accordance with approved Investigation Work Plan, the geophysical methods initially employed for the survey were electromagnetic induction (EM-31) and ground penetrating radar (GPR). The geophysical survey was carried out over an area of approximately 1.75 acres covering the northeast portion of the Site where the former ponds had been located based on aerial

photographs (see Figure 2). A grid was laid out over the survey area to provide a reference for the EM-31 readings and GPR traverses. Grid lines were laid out at 6-foot intervals and EM-31 readings were recorded at 3-foot intervals along the lines.

After starting the EM-31 survey, it became obvious that the subsurface materials were highly conductive and that there was a considerable amount of buried metal present. The lowest recorded apparent conductivities, in areas free from the influence of buried metal, were on the order of 100 to 120 milli seimens per meter (mS/m) - which is high for natural or undisturbed earth materials. Due to the high apparent conductivity of the subsurface materials, it was evident that the planned GPR survey would not be effective for profiling the former pond areas and B-1 area. GPR energy is rapidly attenuated in conductive materials and so the depth of investigation would be very limited. Preliminary field testing with the GPR confirmed a penetration depth of only 1 to 2 feet and so use of this technique was curtailed. Instead, based on the early results of the EM-31 survey, it was considered appropriate to supplement the EM-31 survey with an EM-61 survey to assist in identifying areas underlain by buried metal objects and potential sludge areas. The EM-61 instrument provides response indicative of buried metal. An EM-61 survey was therefore completed over the study area using the same measurement grid as for the EM-31 instrument.

2.3 Drilling and Sampling Program

The on-Site boring and sampling investigation commenced on August 5, 1997 and was completed on August 18, 1997. A total of seventeen boreholes (B-1 and GB-01 through GB-16) were completed and eight samples were collected for chemical analysis in accordance with Appendix C (SAMP) of the Work Plan. Figure 2 illustrates the location of the boreholes, boring logs are provided in Appendix B, and a sampling and analyses summary is presented in Table 1. The laboratory analytical results are presented in Section 3.0.

2.3.1 Health and Safety

The on-Site boring investigation followed the Health & Safety Plan provided in the Work Plan enhanced in accordance with the Addendum submitted to the USEPA on July 29, 1997. As per the Addendum, the drilling and sampling program initially began in Level D protection and was accompanied by air monitoring using the following instruments:

- Mini-Rae Photo-ionization detector (PID) for volatile organic compound (VOC) monitoring;
- Foxboro 128, organic vapor analyzer (OVA) which uses a flame ionization detector (FID) for VOC monitoring;
- Jerome Mercury Analyzer for mercury monitoring; and,
- Sensidyne pump with detector tubes for: methylene chloride, benzene, and vinyl chloride monitoring.

All instruments were calibrated, at a minimum, to the operation manual specifications prior to use each day and air monitoring was performed by an on-Site Health & Safety Officer (HSO). As a result of elevated concentrations recorded on the PID and OVA instruments within the exclusion zone (e.g., borehole and breathing zone) at the first borehole location (B-1) testing for benzene, methylene chloride, and vinyl chloride were performed. Concentrations of vinyl chloride within the breathing zone were detected above the OSHA permissible exposure limit (PEL) of 1 ppm. Consequently, the level of protection for all personnel within the exclusion zone was immediately upgraded to Level B protection and maintained at this level throughout the drilling program until August 15, 1997 when the level of protection was downgraded to Level D for the drilling crew based on the air monitoring results. The sampling crew continued in Level B protection because of their need to work in close proximity to the subsurface materials collected for logging the materials and sample preparation.

Regular monitoring of air quality outside the exclusion zone was conducted by the HSO to ensure protection of off-Site receptors.

There were no detections above background recorded on any instrument or detector tube (benzene, methylene chloride, and vinyl chloride) outside the exclusion zone. A summary of the air monitoring is provided in Appendix C.

2.3.2 Drilling Program

The drill rig, augers, rig tools, and split-spoons were thoroughly steam cleaned upon arrival on-Site and prior to leaving the Site with potable water obtained from a water main located on-Site. The augers and rig tools were also thoroughly steam cleaned between each borehole and split-spoon samplers were steamed cleaned after each use and decontaminated in accordance with the

decontamination procedures outlined in Appendix C of the Investigation Work Plan. A temporary decontamination pad was used to contain water and drill cuttings/mud generated from the steam cleaning operations. The water and drill cuttings/mud generated from the steam cleaning were placed into DOT approved 55-gallon drums and labeled and staged on-Site for subsequent disposal.

Each borehole was completed using hollow-stem auger drilling techniques and an all terrain vehicle (ATV) rig with rubber tires so as to protect the geomembrane cover. A minimum area of the geomembrane was cut at each borehole location. Each borehole was advanced with 3-1/4-inch inside diameter hollow stem augers. Soil samples were taken during drilling using a 3-inch outside diameter (OD) split-spoon sampler at continuous intervals through the fill material to the top of natural soil. Blow counts required to drive the split-spoon each 6-inch increment were recorded. The total recovery of each sample was measured and the soil classified using the Unified Soils Classification System (USCS) based on visual description. Soil samples were monitored for the presence of volatile organic compounds (VOCs) using a PID and readings were recorded on the boring log.

A total of five boreholes (B-1, GB-01, GB-02, GB-03, and GB-10) were advanced to greater depth to obtain a relatively undisturbed sample of the meadow mat layer and the upper glaciolacustrine varved unit using shelby tube samplers. Shelby tube sampling was conducted in conformance to the procedure outlined in the Investigation Work Plan.

Upon completion of each borehole, the borehole was tremie grouted with a cement/bentonite mixture to ground surface and the geomembrane was temporarily secured. The geomembrane at each boring location will be permanently repaired in accordance with the specifications outlined in the Investigation Work Plan. All drill cuttings were placed into DOT approved 55-gallon drums and labeled and staged on-Site for subsequent disposal.

2.3.3 Analytical Sampling Program

Select samples of the subsurface material were collected from 2-foot intervals and analyzed for Target Compound List and Target Analyte List constituents (TCL/TAL; minus cyanide). In addition, samples were also analyzed for pH, moisture content, grain size, total organic carbon (TOC) and oil and grease. Samples collected for the TCL volatile organic analysis were collected from a discrete 6-inch interval that was biased toward the interval of highest apparent

contamination based on air monitoring using a PID instrument. After the volatile organic sample was collected, the remaining material was placed in a decontaminated stainless steel bowl. Large debris items were removed, the sample was homogenized using a stainless steel spoon, and the remaining sample containers were filled with the homogenized soil.

Quality assurance/quality control (QA/QC) samples were collected to monitor the quality and integrity of the field and laboratory techniques. One field duplicate at location GB-04D (FGB-04D); five field rinsate blanks (RFF-01 and RFF-03 through RFF-06); and two matrix spike, matrix spike duplicates (MS/MSDs) at location B-1B and GB-04B were collected. The field rinsate blanks included one sample collected per day per equipment type.

All sampling equipment was decontaminated following the procedure set out in Appendix C of the Investigation Work Plan and samples were managed under strict chain-of-custody procedures.

2.3.4 Analytical Testing & Validation

The initial samples were analyzed for TCL and TAL (minus cyanide), TOC and oil and grease parameters by CompuChem Laboratories (sample B-1 and rinsate sample RFF-01). However, due to problems encountered with overnight courier services as a result of the UPS strike, it was necessary to secure the services of a local laboratory for analytical services during this investigation to achieve compliance with sample hold times as described in a letter to USEPA dated August 13, 1997. Accutest of Dayton, New Jersey therefore performed all analytical testing of the remaining samples with the exception of TOC analyses that were performed by Accredited Laboratories of Carterat, New Jersey. All three laboratories used are certified by the State of New Jersey for chemical testing. Moisture content, pH, grain size analysis, and unconsolidated/undrained compressive strength analysis (ASTM D2850) was performed by Golder Associates soils laboratory located in Mt. Laurel, New Jersey. The Golder Laboratory is certified by ASTM for soils testing. The laboratory testing program is summarized in Table 1.

All chemical data was validated in accordance with USEPA Region II Standard Operating Procedure. A data validation narrative is included in Appendix D.

3.0 FFS INVESTIGATION RESULTS

3.1 Surface Geophysical Survey

An interpretation can be made of the distribution of anomalous high apparent conductivity zones thought to be associated with the sludge material from the data collected with the EM-31 and EM-61 instruments. The premise of this analysis is that sludge materials form a highly conductive material which can be distinguished from buried metal by comparison of the EM-31 and EM-61 data, since the EM-61 essentially responds only to buried metal. Using this approach, two potential sludge areas (Areas 1 and 2) were identified as shown on Figure 3 together with other areas that indicate substantial buried metal and debris. Figure 3 also shows the approximate maximum limit of the two former ponds based on review of aerial photographs and the location of previous boring B-1 as presented in the Investigation Work Plan.

Details of the geophysical procedures and results are presented in Appendix A and in summary, interpretation of the geophysical survey data indicates the following:

- Two areas (Areas 1 and 2) of anomalous high apparent conductivity materials potentially associated with sludge material were identified;
- Previous boring B-1, which encountered sludge, is centrally located within Area 1; and
- A substantial proportion of Areas 1 and 2 contains buried metal and debris.

Based on this data, the following recommendations for the on-Site boring program were submitted to the USEPA in a letter dated July 31, 1997.

B-1 Area Borings

Proceed with the boring program as outlined in the Investigation Work Plan, avoiding areas that contain debris. This program included a boring at location B-1 and initially four surrounding locations (GB-01 through GB-04) on a 20-foot spacing to assess the presence of sludge. Additional borings were to be added, as necessary, to delineate the sludge within Area 1 that was relatively debris free.

Former Pond Area Borings

As per the Investigation Work Plan, anomalies of significant size identified by the geophysical survey having a signature consistent with that found in the B-1 area, were to be investigated by means of verification boring. On this basis, a verification boring (GB-05) was completed in Area 2 to provide a physical description of the material. If sludge material similar to that found in Area 1 was encountered, a sample of the material was to be collected and submitted to the laboratory for analysis. If additional borings were deemed necessary to define the extent of sludge in Area 2, the investigation was to be conducted similar to the B-1 area investigation described above.

3.2 Subsurface Investigation

The subsurface investigation interpretation presented here is predominantly based on data obtained during the FFSI but also includes data previously obtained on-Site by Dames and Moore (1989) and Canonie (1992).

3.2.1 General Succession

The types of materials encountered during the drilling program consisted of man-made fill and sludge material underlain by marine and marsh deposits. A brief description of the materials encountered is provided below, the locations of the boreholes are shown on Figure 2, and geologic cross-sections are presented as Figures 4 and 5.

Man-Made Fill Unit

The unit directly underlying the area investigated consists of miscellaneous man-made fill. The fill materials encountered have a wide range of composition and particle size consisting of construction debris, brick, asphalt, wire, concrete, wood, glass, plastic, etc. The predominant soil material in which the debris is encountered consists of a silty clay or clayey silt matrix. The variable composition of the fill results in a highly erratic response to split-spoon penetration as measured by the Standard Penetration Test (SPT) blow counts. The blow counts ranged from 6 to as much as 111, and at six locations split-spoon refusal was encountered (GB-03, GB-08, GB-12, GB-13, GB-15, and GB-16).

In addition, during the course of the drilling program, some of the SPTs did not recover any sample (B-1, GB-07, GB-08, GB-09, GB-11, and GB-12) due to large debris blocking the opening of the 3-inch OD split-spoon sampler. At four locations (GB-08, GB-11, GB-13, and GB-15), there was difficulty in advancing the hollow stem augers through the fill material due to the presence of larger debris material. At location GB-08 there was large bundle of wire wrapped around the lead auger when the augers were pulled from the borehole. These observations during the drilling program further substantiate the heterogeneity and varying quantity and sizes of materials within the fill, even in areas which were relatively debris free based on the geophysics results.

Sludge Material

Materials consisting of predominately sludge or a mixture of sludge, fill and peat materials were encountered in discrete zones ("pockets") within the fill unit. Two types of sludge materials (based on physical properties) were encountered:

- A black sludge with a grease-like consistency (similar to the material described in the borehole log for B-1 during the RI); and
- A brown sludge with fine sand.

In addition, varying quantities and sizes of glass, wood, brick and plastic debris was also present in some of the sludge material encountered. The SPT blow counts for materials containing sludge were not as variable as in the fill unit, ranging from 2 up to 26 in sandier portions or portions containing some debris. Difficulty with drilling penetration was not encountered and split-spoon sample recovery was generally good.

The particle size analysis performed on sludge/fill material indicates that they generally consist of fines, some fine sand, with trace to some fine gravel. Particle size distribution curves are included in Appendix E.

Marine and Marsh Unit

A "meadow mat" of peat, organic silt and clay intermixed with sand is the youngest natural unit underlying the Site. The peat encountered in the boreholes was predominately a fibrous organic material and was encountered in seven boreholes (GB-04, GB-05, GB-08, GB-11, GB-13, GB-15, and GB-16). Gray organic silty clay, clayey silt, and silty fine sand underlie the peat.

3.2.2 Nature and Extent of Sludge "Hot-Spot"

A total of seventeen boreholes (B-1, and GB-01 through GB-16) were completed to define the limits of the sludge "hot-spot". The drilling commenced at location B-1 (Phase I) and proceeded outward to the four surrounding locations (GB-01 through GB-04) on a 20-foot spacing. Sludge material was encountered at locations GB-02 and GB-04 and a fine grained soil material with little debris was encountered at location B-1 from 0 to 4 feet bgs. It should be noted that due to the problems encountered with an overnight shipment of samples, an additional boring was necessary to obtain replacement samples of sludge material encountered in borehole GB-02. This replacement boring, GBR-02, was completed within 2 feet from the original borehole. Borings GB-01 and GB-03 did not encountered sludge or any similar fine grained materials.

As per the Investigation Work Plan, additional borings were completed approximately 20 feet outward from GB-02 and GB-04 to assess the areal extent of the sludge material. The boring investigation proceeded in a phased manner locating each additional boring progressively further from the B-1 area so as to delineate the extent of the sludge. The area was defined based primarily on the physical characteristics of the materials (i.e., sludge or fine grained soil materials free of debris) encountered in the boreholes and secondarily the PID readings of samples. A total of 17 borings were completed and a discussion of the program and the rationale for the boring locations is provided below.

- Phase II: Defining the areal extent of the sludge west of boring GB-04. This ultimately included the completion of three additional borings, GB-06, GB-07 and GB-08. Borings GB-06 and GB-07 both encountered sludge material. Boring GB-08, the boring furthest outward (approximately 60 feet) from GB-04 did not encounter sludge or predominately fine grained soil materials thereby defining the limit of the sludge "hot-spot" area.

- Phase III: Defining the extent of the sludge material north and east of boring GB-02. This ultimately included two additional borings, GB-09 and GB-10. Sludge material or predominately fine grained materials were not encountered in either boring thereby defining the limit of the sludge "hot-spot" area north and east of boring GB-02.

- Phase IV: Defining the areal extent of sludge material to the south of borings GB-04, GB-06, and GB-07. This investigation ultimately included the completion of borings GB-11 and GB-12. Borings GB-11 and GB-12 did not encounter sludge or predominately fine grained soil material. Therefore, the extent of the sludge "hot-spot" area to the south of borings GB-04, GB-06, and GB-07 was considered completed.

- Phase V: Defining the areal extent of sludge material to the north of borings GB-04, GB-06, and GB-07. This involved completion of borings GB-13 and GB-14 both of

which encountered sludge material. Additional borings to the north of GB-14 were not completed because of its close proximity to the edge of the slurry wall. Borings GB-15 and GB-16 were drilled to the north and west of boring GB-13. Sludge or predominately fine grained soil material was not encountered in either boring thereby defining the limit of the sludge "hot-spot" area.

The remaining part of the investigation included the completion of boring GB-05, which was located in the area identified as Area 2 from the geophysical survey. This boring did not encounter any sludge or predominately fine-grained material. Additionally, the PID readings from the soil samples obtained from the split-spoon sampler were generally non-detect. Therefore, based on the physical characteristics and PID readings this area was not considered a potential sludge "hot-spot" area. As such, additional borings were not completed nor were samples submitted for chemical analysis as per the Investigation Work Plan.

Based on the data collected from the boreholes geologic cross-sections are provided as Figures 4 and 5 and the estimated areal extent of the sludge "hot-spot" area is shown on Figure 6. The data collected from the boreholes generally agrees with the interpreted results from the geophysical survey. However, the actual area containing sludge material is not as extensive as the potential area interpreted from the geophysical survey results. Boring investigation of the western portion of Area 1 was limited due to the presence of large buried debris as indicated by the geophysics and confirmed by the RI data from Test Pit TP-15 and piezometer P-4. TP-15 and P-4 also did not encounter sludge material or elevated PID readings.

A total of eight samples representing the sludge "hot-spot" area (six samples of sludge and two samples of fine grained soil material) were submitted for analysis (refer to Table 1). As per the Investigation Work Plan, sludge-like material encountered in borings B-1 and GB-01 through GB-04 was sampled and submitted for analysis. Additionally, where greater than four feet of sludge/fine grained material was encountered (as at GBR-02 and GB-04), then two samples from each boring were submitted for analysis. In accordance with the Investigation Work Plan, additional borings completed beyond 40 feet from B-1, as necessary to continue define the limits of the sludge "hot-spot", were only used for defining the physical characteristics of subsurface materials.

Boring B-1 did not encounter sludge material. However, the first four feet of the materials encountered consisted predominately of silty clay with very little debris. A sample having the

highest recorded PID reading representing the 2-4-foot interval (B-1B) was submitted for analysis. Sludge samples submitted from boreholes GB-06, GB-07, and GB-14 were also submitted for analysis.

3.3 Testing

3.3.1 Chemical Testing

The analytical chemistry data from this investigation is presented in full in Appendix E and a summary of the detections is provided in Table 2. The data is also compared to the USEPA Initial Preliminary Remediation Goals for the Site (PRGs; USEPA letter dated November 19, 1993) for those constituents for which an initial PRG value is available.

Remedial Investigation Analytical Results

During the remedial investigation, 34 soil samples were collected within the FOU fill from 17 boring locations (Dames and Moore, 1990). Boring locations were biased toward potential source areas as identified in aerial photographs and former operation areas. Samples were collected from each boring at two intervals: 0 to 2 feet (surface) and 5 to 6 feet (subsurface). The samples were analyzed for priority pollutant VOCs, SVOCs, pesticides, PCBs, and metals.

A number of chemical constituents were detected, primarily VOCs, SVOCs (generally polynuclear aromatic hydrocarbons or PAHs), three pesticides, PCBs, and metals. Most constituent detections were less than the PRGs. Compounds detected in the RI boring B-1 which exceeded the initial PRGs comprise tetrachloroethene, trichloroethene, PCBs (aroclor-1242), arsenic, and lead. Boring B-1 exhibited the highest concentrations of VOCs and PCBs encountered on the Site.

FFSI Analytical Results

Volatile Organic Compounds

A total of sixteen VOC compounds were detected. The most prevalent VOCs (detected in more than half the samples) comprise benzene, chlorobenzene, 1,1-dichloroethane, ethylbenzene, methylene chloride, 4-methyl-2-pentanone (MIBK), tetrachloroethene (PCE), trichloroethene (TCE), toluene, and total xylenes. Total VOC concentrations ranged from 1,765 mg/kg (GB-14C) to 36,320 mg/kg (GB-07F) with the highest VOC concentrations detected in samples GB-04B, GB-04D, GB-06D, and GB-07F.

A total of four compounds were detected at concentrations above the initial PRGs. 1,2-dichloroethane (PRG 62 mg/kg) was detected in one of the eight samples (GB-07F) at a concentration of 340 mg/kg. Vinyl chloride (PRG 3 mg/kg) was detected in two of the eight samples at concentrations of 58 mg/kg (GBR-02C) and 44 mg/kg (GB-14C). TCE was detected in all eight samples and exceeded the initial PRG value of 520 mg/kg in six of the eight samples. Concentrations of TCE ranged from 99 mg/kg (GB-14C) to 8,900 mg/kg (GB-07F). PCE was detected in all eight samples at concentrations above the initial PRG value of 110 mg/kg. Concentrations of PCE ranged from 370 mg/kg (GB-14) to 8,900 mg/kg (GB-07F).

In general, the constituents detected in the FFSI samples are consistent with the RI analytical data for boring B-1. However, the total VOC concentrations detected in RI boring B-1 were generally lower. Total VOC concentrations detected in Boring B-1 during the RI were 12,167 mg/kg for the surface sample (0-2 feet) and 6,502 mg/kg for the subsurface sample (5-6 feet). The next highest concentration of total VOCs detected on-Site during the RI was 9,900 mg/kg (subsurface) at location MW-7D.

Semi-Volatile Organic Compounds

A total of thirty-four SVOC compounds were detected, of which nineteen were detected in more than half of the samples. Compounds which were detected in all eight samples, include phenol, 1,2-dichlorobenzene, 4-methyphenol, naphthalene, 2-methylnaphthalene, and bis(2-ethylhexyl)phthalate.

Total SVOC concentrations ranged from 15 mg/kg (B-1B) to 1,327 mg/kg (GB-07F) with the highest SVOC concentrations detected in samples GB-04B, GB-06D, and GB-07F.

Three compounds were detected at concentrations above the initial PRGs. Benzo(a)pyrene (1.2 mg/kg), and dibenz (a,h)anthracene (1.1 mg/kg) were each detected in one sample (GBR-02B) above the initial PRG value of 0.78 mg/kg. Bis(2-ethylhexyl)phthalate was detected in three of the eight samples (GB-04B, GB-06D, and GB-07F) at concentrations above the initial PRG value of 400 mg/kg.

In general, there were fewer SVOC constituents detected during the RI. The total SVOC concentrations detected in the RI boring B-1 was 505 mg/kg (surface) and 1,078 mg/kg

(subsurface). The highest concentration of total SVOCs detected on-Site during the RI was 3,913 mg/kg (subsurface) at location B-3.

Pesticide/PCBs

A total of three pesticide compounds were detected. Endrine ketone was detected at a concentration of 12 mg/kg in sample FGB-04D (field duplicate for GB-04D). There is no initial PRG value available for this compound. Aldrin (1.6 mg/kg) and dieldrin (0.86 mg/kg) were detected in only one sample (B-1B) above the initial PRGs of 0.34 mg/kg and 0.36 mg/kg, respectively.

Aldrin (4 samples), dieldrin (10 samples), and methoxychlor (1 sample) were detected during the RI. The highest concentrations detected in the RI were 57 mg/kg for aldrin and dieldrin at location B-6 and 150 mg/kg for methoxychlor at location B-4.

Aroclor-1242 was detected in all FFSI samples at concentrations ranging from 49 mg/kg (B-1B) to 1,400 mg/kg (GB-06D) which exceed the upper initial PRG value of 25 mg/kg. The highest concentrations of PCBs were detected in samples GB-04B, GB-04D, GB-06D, and GB-07F. As previously discussed, the RI boring B-1 encountered at 15,000 mg/kg (0 to 2 feet) and 210 mg/kg (5-6 feet).

Inorganics

TAL inorganics were detected in all of the FFSI samples with beryllium, lead, and arsenic at concentrations exceeding the initial PRG values. Beryllium (PRG 1.34 mg/kg) was detected at a concentration of 1.80 mg/kg and 2.50 mg/kg in samples GB-4B and GB-14C, respectively. Lead was detected at concentrations of 947 mg/kg (GB-4B), 999 mg/kg (GB-04D), 813 mg/kg (GB-06D) and 1,320 mg/kg (GB-07F) which exceed the lower initial PRG value of 500 mg/kg; only one sample (GB-07F) exceeded the upper initial PRG value of 1,000 mg/kg. Arsenic (PRG 3.2 mg/kg) was detected at concentrations ranging from 4 mg/kg (GBR-02B) to 11.2 mg/kg (B-1B).

Additional Parameters

Total organic carbon (TOC) concentrations ranged from 16,000 mg/kg (B-1B) to 62,900 mg/kg (GB-6D). Oil and grease concentrations by the gravimetric method ranged from 19,000 mg/kg

(GBR-02B) to 106,000 mg/kg (GB-07F) and concentrations by the infrared method ranged from 3,040 mg/kg (GB-14C) to 83,700 mg/kg (GB-4B).

3.3.2 Geotechnical Testing

Shelby tube soil samples were obtained of the peat and grey silt/bedded clay unit directly underlying the FOU fill. A total of seven Shelby tube samples were obtained and three were selected for index and strength testing. The detailed results of the geotechnical tests are included in Appendix F.

The boring investigation indicated that the peat consist predominately of an organic fibrous material up to 3 feet thick. As a result of the limited thickness of the peat material it was difficult to obtain a representative sample. Only one of the Shelby tubes recovered peat (sample ST-03 at location GB-02), however, this material was more representative of the contact between the peat and underlying grey silt/bedded clay. The bottom portion of the peat becomes less fibrous and comprises more of silty material. Based on the unconsolidated/undrained compressive strength (U/UCS) test performed on sample ST-03, the lower peat has a maximum undrained shear strength of 360 pounds per square foot (psf).

The underlying grey silt/bedded clay unit is variable in composition (e.g. sample ST-04 is predominately a clay material and sample ST-05 is predominately a silt material). U/UCS tests were completed on two Shelby tube samples (ST-04 at location GB-02 and ST-05 at location GB-01) and indicated maximum undrained shear strengths of 2,024 psf (ST-04) and 499 psf (ST-05).

Based on the data obtained from the geotechnical laboratory testing and information collected during the drilling program, slope stability calculations can be made to determine the maximum steepness of the excavation slope that would be stable without failure. Slope stability calculations are included in Appendix F and indicate that the critical failure mechanism is near surface failure through the fill. A slope of 4.5(H):1(V) or flatter would be required to achieve a marginal factor of safety under existing conditions.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The data collected and presented in this Report has identified a discrete area, as shown on Figure 6, that meets the criteria of a sludge "hot-spot", as defined in Section 1.0 of this Report. In summary, the data collected indicates the following:

- The sludge "hot-spot" area, as defined by its physical properties, is approximately 4,000 ft^2 in areal extent and consists of predominately of sludge material and fine grained soil with little debris. Assuming an average thickness of 10 feet, this equates to a volume of approximately 1,480 cubic yards.
- The chemical characteristics of the sludge "hot-spot" include the highest VOC and PCB concentrations detected anywhere on-Site.
- The geotechnical data and associated excavation stability analyses indicate that an excavation side slope of 4.5H:1V would only be marginally stable under existing conditions.

Excavation of the materials within the sludge "hot-spot" area would be extremely difficult given the physical constraints (e.g., slope stability) and the chemical characteristics of the material to be excavated (e.g., extremely high levels of VOCs present in the material). As discussed in detail in the Investigation Work Plan (Golder Associates, 1996), the implementation difficulties and risks associated with the sludge "hot-spot" excavation and handling at the Site are such that in-situ remedial alternatives warrant serious consideration in the FFS.

4.2 Recommendations

In order to explore the feasibility of in-situ treatment options, additional treatability study work is necessary. A work plan addressing the required scope of work and number of samples that will be collected will be submitted for USEPA approval. It should be noted that the schedule outlined in the Work Plan (Golder Associates, December 1995) included an optional item for treatability studies, should this be necessary based on data collected during this FFSI.

5.0 REFERENCES

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TABLE 1
SAMPLING AND ANALYSES SUMMARY
216 PATERSON PLANK ROAD SITE
CARLSTADT, NEW JERSEY

SAMPLE POINT ID	SAMPLE DEPTH (FT.)	SAMPLE MEDIA	SAMPLING DATE	ANALYTICAL PARAMETER (1)	QA/QC (2)	
					FIELD DUPLICATE	MS/MSD
B-1B	2-4 (VOC-3.5-4.0)	SILTY CLAY/CLAY (FILL)	8/6/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		B-1B
GBR-02B	2-4 (VOC-3.5-4.0)	SLUDGE	8/18/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		
GBR-02C	4-5.2 (VOC-4.7-5.2)	SLUDGE	8/18/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		
GB-04B	2-4 (VOC-3-3.5)	SILTY CLAY (FILL)	8/11/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		GB-04B
GB-04D	6-8 (VOC-6.5-7.0)	SLUDGE	8/11/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease	FGB-04D	
GB-06D	6-8 (VOC-7.2-7.7)	SLUDGE/SOIL (FILL)	8/11/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		
GB-07F	10-12 (VOC-10.8-11.3)	SLUDGE/SOIL (FILL)	8/12/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		
GB-14C	4-5.7 (VOC-5.2-5.7)	SLUDGE	8/15/97	TCL/TAL, pH, moisture content, grain size analysis, TOC, and oil & grease		
GEOTECHNICAL (3)						
ST-03 (GB-02)	8.5-11.0	PEAT	8/7/97	Unconsolidated undrained triaxial compression with pore water pressure measurement & grain size analysis		
ST-04 (GB-02)	12.5-15.0	SILTY CLAY	8/7/97	Unconsolidated undrained triaxial compression with pore water pressure measurement & grain size analysis		
ST-05 (GB-01)	8.5-11.0	SILT	8/8/97	Unconsolidated undrained triaxial compression with pore water pressure measurement & grain size analysis		

Notes:

(1) - TCL VOCs, SVOCs, and Pest/PCBs Methodology: CLP SOW OLMO3.2 (CompuChem OLMO3.1); TAL Metals Methodology: CLP SOW ILMO3.0 (CompuChem ILMO4.0); Oil & Grease Methodology: SW846-9070/EPA 413.2, Total Organic Carbon Methodology: EPA Lloyd Khan Method, pH Methodology: LaMotte; Moisture Content Methodology: ASTM D2216; Grain Size Analysis Methodology: ASTM D-412/422 & D-1140; and, unconsolidated undrained triaxial compression with pore water pressure. measurement Methodology: ASTM D-2850

(2) - Equipment Rinsate Blanks were taken one per day of sampling.

(3) - A total of seven shelby tube samples were collected of which three samples, based on recovery, were submitted for analysis.

TABLE 2A
SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS
SOIL/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
ORGANIC DETECTIONS - VOLATILES

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97 RESULT (mg/kg)	GBR-02B Sampled:8/18/97 RESULT (mg/kg)	GBR-02C Sampled:8/18/97 RESULT (mg/kg)	GB-4B Sampled:8/11/97 RESULT (mg/kg)	GB-4D Sampled:8/11/97 RESULT (mg/kg)	FGB-4D (Dup.) Sampled:8/11/97 RESULT (mg/kg)
198	Benzene	-	28	38	34	73	66
1,220,000	2-Butanone	-	-	-	-	260	-
40,000	Chlorobenzene	8.4	86	74	380	1,200	1,000
940	Chloroform	-	-	-	54	30	31
200,000	1,1-Dichloroethane	3.4	-	-	51	210	160
---	Total 1,2-Dichloroethene	4.2	-	-	30	24	-
62	1,2-Dichloroethane	-	-	-	-	-	-
200,000	Ethylbenzene	110	420	350	940	1,100	970
760	Methylene Chloride	-	38	38	52	100	100
---	4-Methyl-2-Pentanone	19	-	97	190	460	420
184,000	1,1,1-Trichloroethane	-	-	-	430	150	150
110	Tetrachloroethene	330	1,200	880	5,200	6,200	4,600
400,000	Toluene	470	2,200	1,800	4,700	5,900	4,500
520	Trichloroethene	520	2,400	1,600	6,000	6,700	5,500
3	Vinyl chloride	-	-	58	-	-	-
4,000,000	Total Xylenes	720	2,600	2,100	5,300	5,700	5,200

Notes:
Units are in mg/kg.
(1) - EPA initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.
All results reported on a wet weight basis.
"---" indicates that no initial PRG is available.
Indicates exceedance of the EPA initial PRG.
"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

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TABLE 2A
SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS
SOIL/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
ORGANIC DETECTIONS - VOLATILES

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D Sampled:8/11/97 RESULT (mg/kg)	GB-7F Sampled:8/12/97 RESULT (mg/kg)	GB-14C Sampled:8/15/97 RESULT (mg/kg)
198	Benzene	57	62	28
1,220,000	2-Butanone	340	370	57
40,000	Chlorobenzene	260	260	49
940	Chloroform	240	340	-
200,000	1,1-Dichloroethane	120	-	16
---	Total 1,2-Dichloroethene	49	28	-
62	1,2-Dichloroethane	-	340	-
200,000	Ethylbenzene	1,100	1,100	100
760	Methylene Chloride	200	450	-
---	4-Methyl-2-Pentanone	440	470	42
184,000	1,1,1-Trichloroethane	1,200	2,700	-
110	Tetrachloroethene	6,000	8,900	370
400,000	Toluene	5,700	6,700	410
520	Trichloroethene	7,300	8,900	99
3	Vinyl chloride	-	-	44
4,000,000	Total Xylenes	6,100	5,700	550

Notes:
Units are in mg/kg.
(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.
All results reported on a wet weight basis.
"---" indicates that no initial PRG is available.
Indicates exceedance of the EPA initial PRG.
"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

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TABLE 2B
SUMMARY OF CHEMICAL ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
ORGANIC DETECTIONS - SEMIVOLATILES

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97 RESULT (mg/kg)	GBR-02B Sampled:8/18/97 RESULT (mg/kg)	GBR-02C Sampled:8/18/97 RESULT (mg/kg)	GB-4B Sampled:8/11/97 RESULT (mg/kg)	GB-4D Sampled:8/11/97 RESULT (mg/kg)	FGB-4D (Dup.) Sampled:8/11/97 RESULT (mg/kg)
50,000	Phenol	1.7	56	72	48	64	70
184,000	1,2-Dichlorobenzene	0.6	14	8.4	34	28	19
---	1,4-Dichlorobenzene	0.33	-	-	-	-	-
---	2-Methylphenol	-	3.5	3.3	-	-	-
---	4-Methylphenol	0.46	13	15	18	15	16
1,020	Nitrobenzene	-	-	-	-	-	-
6,000	Isophorone	1.4	50	13	-	14	8.7
40,000	2,4-Dimethylphenol	-	12	11	9.9	-	9
20,000	1,2,4-Trichlorobenzene	0.081	2.3	0.95	3.3	3	2
82,000	Napthalene	1.1	51	18	75	52	30
---	2-Methylnapthalene	0.51	21	6.5	25	18	12
---	2-Chloronaphthalene	-	55	40	31	22	16
2,000,000	Dimethylphthalate	-	-	-	2.4	-	-
122,000	Acenaphthene	-	1.6	-	0.89	-	-
---	Dibenzofuran	0.16	5.4	2.1	2.6	3.2	2
1,640,000	Diethylphthalate	-	-	-	12	1.2	1.5
82,000	Fluorene	0.077	3.2	0.89	1.2	1.6	1.2
---	Phenanthrene	0.24	12	4.3	4.1	4.2	2.8
620,000	Anthracene	-	1.8	-	-	-	-
---	Carbazole	-	0.92	-	-	-	-
---	Di-n-butylphthalate	0.37	-	-	52	8.7	9.1
82,000	Fluoranthene	-	6.9	1.8	2.5	2	1.3
62,000	Pyrene	-	4.6	1.1	1.6	1.8	0.98
400,000	Butylbenzylphthalate	0.043	-	-	20	2.2	2.9
7.8	Benzo(a)anthracene	-	2.4	0.55	0.9	0.59	0.47
78,000	Chyrsene	-	3	0.72	1.1	1.1	0.81
400	Bis(2-ethylhexyl)phthalate	7.3	37	8.5	600	190	110
40,000	Di-n-octylphthalate	0.5	-	-	23	4.5	4.7
7.8	Benzo(b)fluoranthene	0.069	2.3	-	0.82	0.7	-
78	Benzo(k)fluoranthene	0.068	1.6	-	0.62	0.49	-
0.78	Benzo(a)pyrene	-	1.2	-	-	-	-
7.8	Indeno(1,2,3-cd)pyrene	-	1.3	-	-	-	-
0.78	Dibenz(a,h)anthracene	-	1.1	-	-	-	-
---	Benzo(g,h,I)perylene	-	1.4	-	0.6	-	-

Notes:
Units are in mg/kg.
(1) - EPA initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.
All results reported on a wet weight basis.
"---" indicates that no initial PRG is available.
Indicates exceedance of the EPA initial PRG.
"-" indicates that the constituent was not detected as qualified with a "U" ,"UJ" or "R".

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TABLE 2B
SUMMARY OF CHEMICAL ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
ORGANIC DETECTIONS - SEMIVOLATILES

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D Sampled:8/11/97 RESULT (mg/kg)	GB-7F Sampled:8/12/97 RESULT (mg/kg)	GB-14C Sampled:8/15/97 RESULT (mg/kg)
50,000	Phenol	140	95	25
184,000	1,2-Dichlorobenzene	57	130	3.4
---	1,4-Dichlorobenzene	-	-	-
---	2-Methylphenol	-	-	-
---	4-Methylphenol	24	20	5.6
1,020	Nitrobenzene	-	380	-
6,000	Isophorone	33	20	1.1
40,000	2,4-Dimethylphenol	19	10	4.7
20,000	1,2,4-Trichlorobenzene	5.7	-	-
82,000	Napthalene	73	57	3
---	2-Methylnapthalene	28	21	1.1
---	2-Chloronaphthalene	97	35	23
2,000,000	Dimethylphthalate	-	-	-
122,000	Acenaphthene	-	-	-
---	Dibenzofuran	3.9	-	-
1,640,000	Diethylphthalate	4.2	13	-
82,000	Fluorene	2	-	-
---	Phenanthrene	6.3	5.5	-
620,000	Anthracene	-	-	-
---	Carbazole	-	-	-
---	Di-n-butylphthalate	42	56	-
82,000	Fluoranthene	3.7	-	-
62,000	Pyrene	3.6	-	-
400,000	Butylbenzylphthalate	19	37	-
7.8	Benzo(a)anthracene	1.7	-	-
78,000	Chyrsene	2	-	-
400	Bis(2-ethylhexyl)phthalate	610	430	1.3
40,000	Di-n-octylphthalate	37	17	-
7.8	Benzo(b)fluoranthene	-	-	-
78	Benzo(k)fluoranthene	-	-	-
0.78	Benzo(a)pyrene	0.55	-	-
7.8	Indeno(1,2,3-cd)pyrene	0.79	-	-
0.78	Dibenz(a,h)anthracene	-	-	-
---	Benzo(g,h,I)perylene	1.2	-	-

Notes:
Units are in mg/kg.
(1) -EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.
All results reported on a wet weight basis.
"---" indicates that no initial PRG is available.
Indicates exceedance of the EPA initial PRG.
"-" indicates that the constituent was not detected as qualified with a "U" ,"UJ" or "R".

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TABLE 2C
SUMMARY OF CHEMICAL ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
PESTICIDE/PCB DETECTIONS

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97 RESULT (mg/kg)	GBR-02B Sampled:8/18/97 RESULT (mg/kg)	GBR-02C Sampled:8/18/97 RESULT (mg/kg)	GB-4B Sampled:8/11/97 RESULT (mg/kg)	GB-4D Sampled:8/11/97 RESULT (mg/kg)	FGB-4D (Dup.) Sampled:8/11/97 RESULT (mg/kg)
---	Endrine Ketone	-	-	-	-	-	12
0.34	Aldrin	1.6	-	-	-	-	-
0.36	Dieldrin	0.86	-	-	-	-	-
10-25	Aroclor-1242	49	390	300	770	800	680

Notes:

Units are in mg/kg.

(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U", "UJ" or "R".

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TABLE 2C
SUMMARY OF CHEMICAL ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
PESTICIDE/PCB DETECTIONS

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D Sampled:8/11/97 RESULT (mg/kg)	GB-7F Sampled:8/12/97 RESULT (mg/kg)	GB-14C Sampled:8/15/97 RESULT (mg/kg)
---	Endrine Ketone	-	-	-
0.34	Aldrin	-	-	-
0.36	Dieldrin	-	-	-
10-25	Aroclor-1242	1,400	1,300	82

Notes:

Units are in mg/kg.

(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U", "UJ" or "R".

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TABLE 2D
SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
INORGANIC DETECTIONS

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97 RESULT (mg/kg)	GBR-02B Sampled:8/18/97 RESULT (mg/kg)	GBR-02C Sampled:8/18/97 RESULT (mg/kg)	GB-4B Sampled:8/11/97 RESULT (mg/kg)	GB-4D Sampled:8/11/97 RESULT (mg/kg)	FGB-4D (Dup.) Sampled:8/11/97 RESULT (mg/kg)
---	Aluminum	5,140	5,040	3,090	4,270	3,890	3,800
820	Antimony	1.4	1.3	2.7	10.1	8.1	7.4
3.2	Arsenic	11.2	4.0	6.1	12.7	9.3	7.6
---	Barium	349	91.6	119	590	637	653
1.34	Beryllium	0.41	0.56	0.86	1.80	1.30	1.30
1,020	Cadmium	147	6.4	10	43.4	52	39
---	Calcium	19,200	18,800	37,300	23,900	37,400	36,700
10,200 (VI)	Chromium	58	91.9	203	209	265	255
---	Cobalt	2.9	2.7	1.9	5.6	4.7	4.2
76,000	Copper	5,760	975	2,590	6,350	4,180	4,250
---	Iron	9,830	6,140	4,920	13,600	11,400	10,000
500-1,000	Lead	245	228	479	947	999	985
---	Magnesium	2,780	1,340	5,280	2,260	3,280	3,240
---	Manganese	124	80.7	123	189	181	168
620	Mercury	2.2	7.5	2.9	4.7	4.4	3.7
40,000	Nickel	10.5	9.9	12.8	16.7	19.9	18.9
---	Potassium	395	625	480	507	537	529
10,200	Selenium	3.8	-	1.1	1.7	2.2	2.0
10,200	Silver	0.53	2.8	4.9	1.4	6.9	7.2
---	Sodium	6,550	35,800	44,500	10,100	28,000	28,200
144	Thallium	-	-	-	-	-	-
---	Vanadium	12.3	12.9	12.3	19.2	17.5	16.7
620,000	Zinc	242	268	365	1,840	2,260	2,500

Notes:
Units are in mg/kg.
(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.
All results reported on a wet weight basis.
"---" indicates that no initial PRG is available.
Indicates exceedance of the EPA initial PRG.
"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101231

TABLE 2D
SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
INORGANIC DETECTIONS

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D Sampled:8/11/97 RESULT (mg/kg)	GB-7F Sampled:8/12/97 RESULT (mg/kg)	GB-14C Sampled:8/15/97 RESULT (mg/kg)
---	Aluminum	4,830	2,660	3,990
820	Antimony	6.0	12.8	1.2
3.2	Arsenic	10.8	9.3	5.1
---	Barium	619	702	68.3
1.34	Beryllium	1.0	0.72	2.50
1,020	Cadmium	34.1	47.4	6.7
---	Calcium	25,600	19,800	21,900
10,200 (VI)	Chromium	260	233	71.5
---	Cobalt	4.4	4.5	1.4
76,000	Copper	2,970	1,830	10,200
---	Iron	12,000	22,700	3,370
500-1,000	Lead	813	1,320	152
---	Magnesium	2,550	1,420	5,260
---	Manganese	198	153	81.1
620	Mercury	6.2	3.1	0.79
40,000	Nickel	14.8	12.4	7.6
---	Potassium	496	300	443
10,200	Selenium	1.1	2.0	-
10,200	Silver	1.4	1.8	0.6
---	Sodium	13,900	8,540	35,500
144	Thallium	-	-	-
---	Vanadium	18.9	19.3	6.7
620,000	Zinc	2,980	10,000	218

Notes:
Units are in mg/kg.
(1) -EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.
All results reported on a wet weight basis.
"---" indicates that no initial PRG is available.
Indicates exceedance of the EPA initial PRG.
"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101232

TABLE 2E
SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
ADDITIONAL PARAMETER DETECTIONS

INITIAL EPA PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97 RESULT (mg/kg)	GBR-02B Sampled:8/18/97 RESULT (mg/kg)	GBR-02C Sampled:8/18/97 RESULT (mg/kg)	GB-4B Sampled:8/11/97 RESULT (mg/kg)	GB-4D Sampled:8/11/97 RESULT (mg/kg)	FGB-4D (Dup.) Sampled:8/11/97 RESULT (mg/kg)
---	Oil and Grease, Gravimetric	(2)	19000	42000	50900	44800	41300
---	Oil and Grease, Infrared	18700	27000	28300	83700	21900	17800
---	TOC	16000	31700	36600	53500	61500	52600

Notes:

Units are in mg/kg.

(1) - Initial EPA Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

(2) - Analysis not performed.

All results reported on a wet weight basis (sludge) except for sample B-1B.

"---" indicates that no initial PRG is available.

Indicates exceedance of the initial EPA PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101233

TABLE 2E
SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS
SLUDGE/FILL SAMPLES
216 PATERSON PLANK ROAD SITE
ADDITIONAL PARAMETER DETECTIONS

INITIAL EPA PRGs (1) (mg/kg)	PARAMETER	GB-6D Sampled:8/11/97 RESULT (mg/kg)	GB-7F Sampled:8/12/97 RESULT (mg/kg)	GB-14C Sampled:8/15/97 RESULT (mg/kg)
---	Oil and Grease, Gravimetric	**57200**	**106000**	**76900**
---	Oil and Grease, Infrared	**38400**	**47800**	**3040**
---	TOC	**62900**	**30600**	**30800**

Notes:

Units are in mg/kg.

(1) - Initial EPA Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

(2) - Analysis not performed.

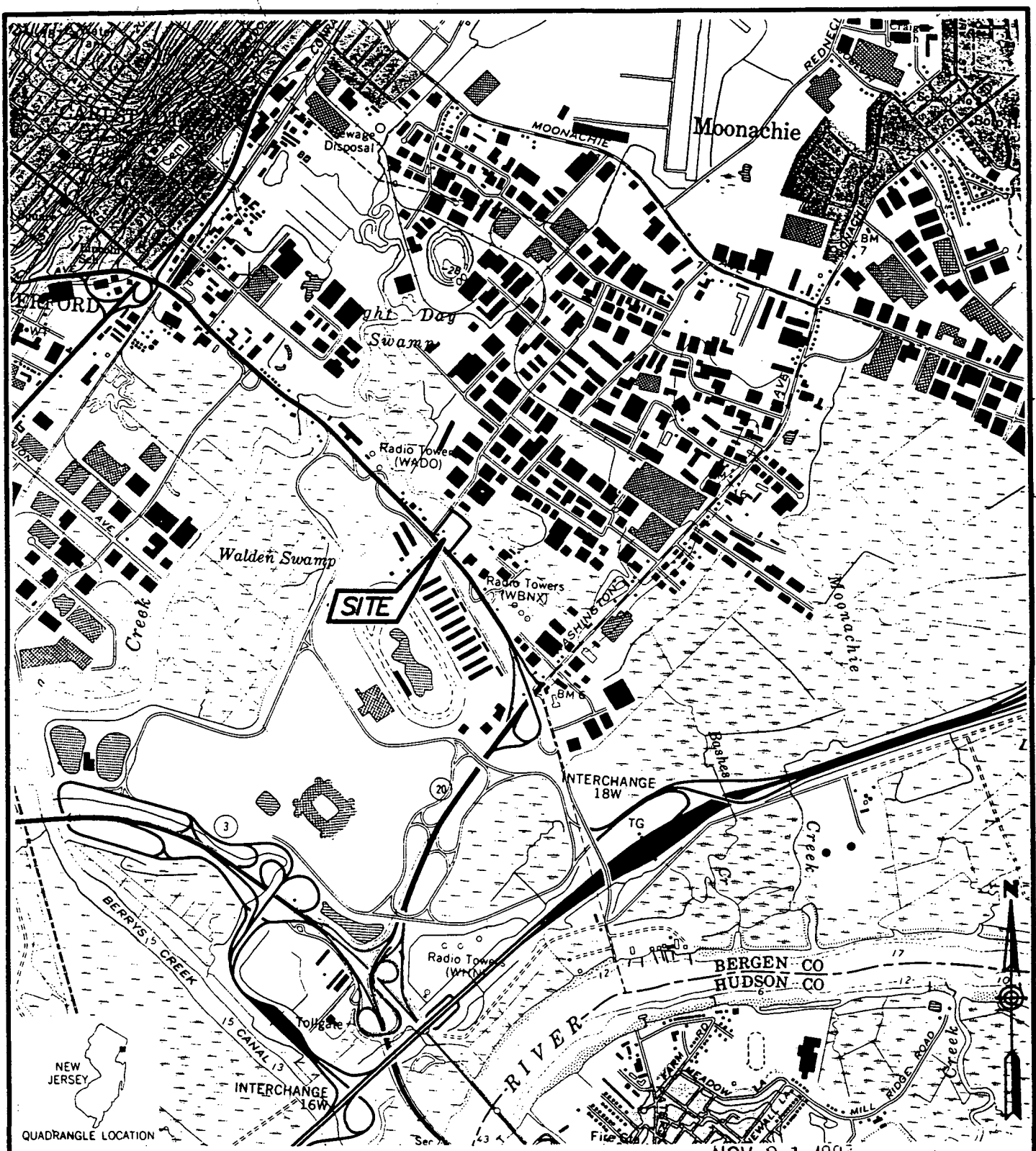
All results reported on a wet weight basis (sludge) except for sample B-1B.

"---" indicates that no initial PRG is available.

Indicates exceedance of the initial EPA PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101234



NOV 2 1 1997

REFERENCE

1.) USGS 7.5 MINUTE WEEHAWKEN QUADRANGLE, NEW JERSEY – NEW YORK, DATE 1967, PHOTOREVISED 1981.

JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	JSG	DATE:	06/05/95
CHK BY:	SDM	FILE No.:	NJ03-266
REV BY:	BR	DR SUBTITLE:	03

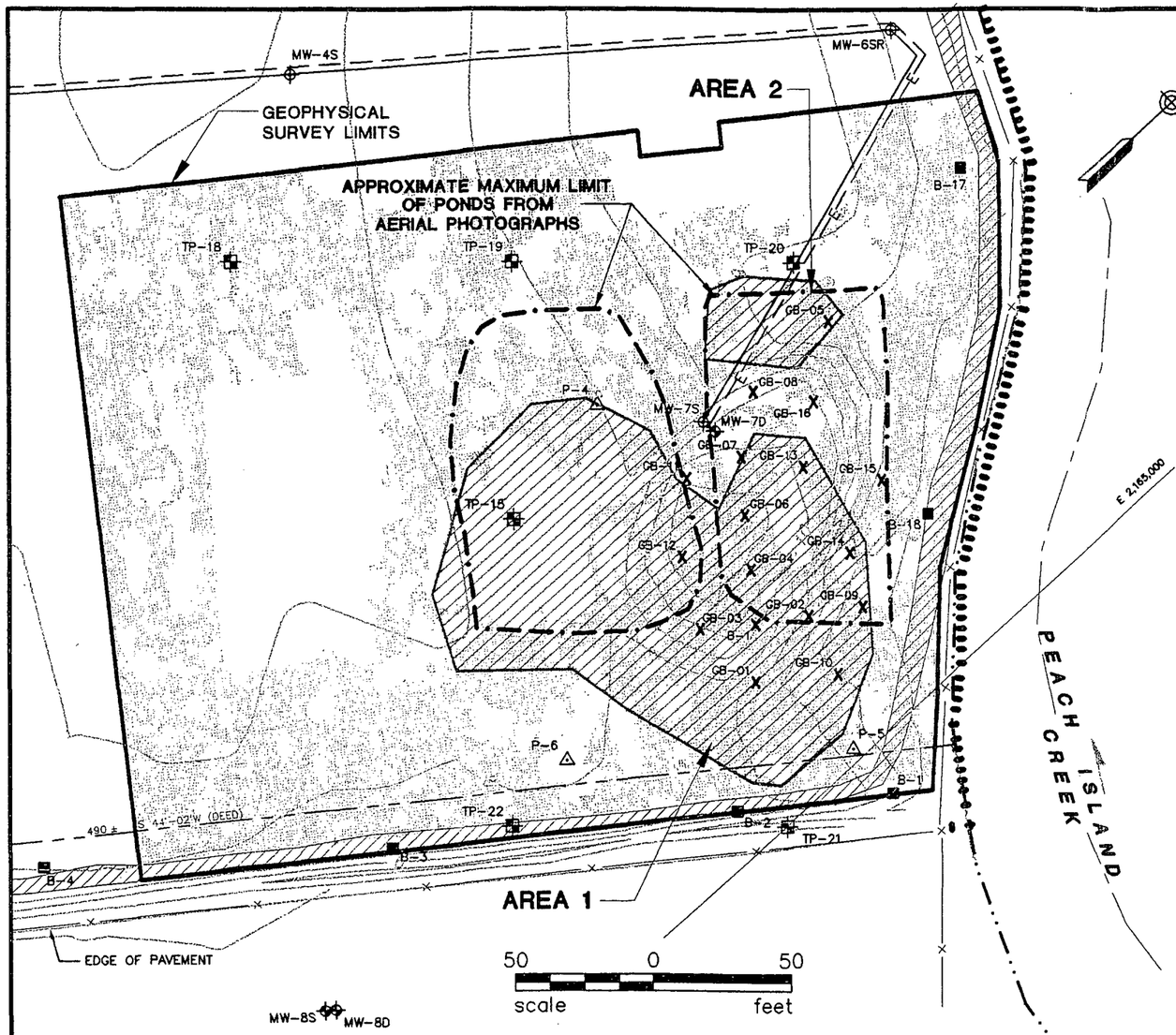
SITE LOCATION PLAN

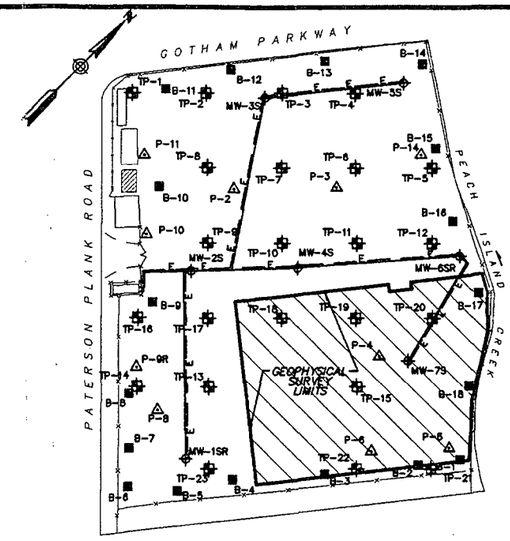
Golder Associates

216 PATERSON PLANK ROAD SITE

FIGURE 1

101235





KEY MAP

200 0 200
scale feet

LEGEND

- AREAS INTERPRETED AS CLEAR FOR DRILLING (AREAS INTERPRETED AS CLEAR OF LARGE BURIED METAL OBJECTS WITHIN 10 FEET OF GROUND SURFACE)
- INTERPRETED SLUDGE AREA
- GB-01 — SOIL BORING LOCATION (COMPLETED AS PART OF THE FFS INVESTIGATION)
- MW-8D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- B-6 — SLURRY WALL CONSTRUCTION INVESTIGATION BORING (INSTALLED DURING REMEDIAL DESIGN)
- TP-2 — TEST PIT (CONDUCTED DURING TEST PIT INVESTIGATION)
- PROPERTY/RIGHT-OF-WAY BOUNDARIES
- 1 FT. CONTOUR LINE (FT. – MSL)
- EDGE OF STREAM
- FENCE
- SLURRY WALL ALIGNMENT
- SHEET PILE WALL ALIGNMENT
- —E— ELECTRIC AND WATER DISCHARGE LINES

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

2.) LOCATION OF SLURRY WALL INVESTIGATION BORINGS AND TEST PIT LOCATIONS ARE APPROXIMATE. BORING & TEST PIT LOCATIONS WERE PREVIOUSLY SURVEYED USING A SITE SPECIFIC COORDINATE SYSTEM.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ IN OCTOBER 1996 AND SOIL BORINGS IN AUGUST 1997.

3.) SLURRY WALL BORINGS AND FEATURES FROM THE INTERIM REMEDIAL MEASURES TAKEN FROM CANONIE ENVIRONMENTAL, 1992 "INTERIM REMEDY FOR FIRST OPERABLE UNIT", AUGUST 1992.

4.) DAMES & MOORE, 1990. "FINAL REPORT – REMEDIAL INVESTIGATION SCP SITE, CARLSTADT, NEW JERSEY", MARCH 1, 1990.

5.) DAMES & MOORE, 1989. – "TEST PIT INVESTIGATION SCP / CARLSTADT JULY 1989 CARLSTADT, NEW JERSEY", AUGUST 4, 1989.

NOV 2 1 1997

JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	DWD	DATE:	10/14/97
CHK BY:	SDM	FILE No.:	NJ03-745
REV BY:		DR SUBTITLE:	13

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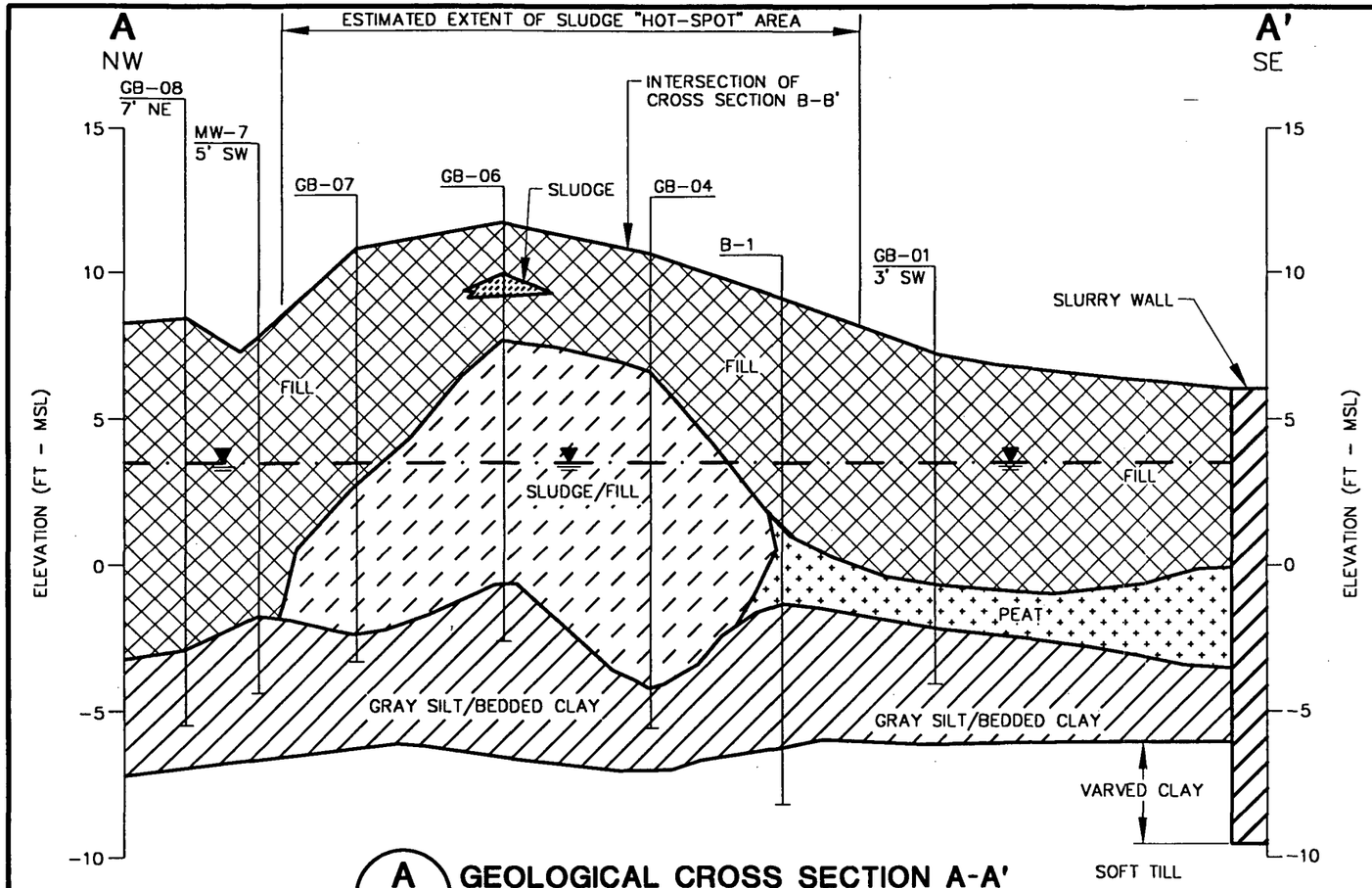
SUMMARY OF GEOPHYSICAL SURVEY RESULTS

216 PATERSON PLANK ROAD SITE | FIGURE 3

101236



A 2 4 GEOLOGICAL CROSS SECTION A-A'

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

2.) LOCATION OF SLURRY WALL INVESTIGATION BORINGS AND TEST PIT LOCATIONS ARE APPROXIMATE. BORING & TEST PIT LOCATIONS WERE PREVIOUSLY SURVEYED USING A SITE SPECIFIC COORDINATE SYSTEM.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

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3.) SLURRY WALL BORINGS AND FEATURES FROM THE INTERIM REMEDIAL MEASURES TAKEN FROM CANONIE ENVIRONMENTAL, 1992 "INTERIM REMEDY FOR FIRST OPERABLE UNIT", AUGUST 1992.

4.) DAMES & MOORE, 1990. "FINAL REPORT – REMEDIAL INVESTIGATION SCP SITE, CARLSTADT, NEW JERSEY", MARCH 1, 1990.

5.) DAMES & MOORE, 1989. – "TEST PIT INVESTIGATION SCP / CARLSTADT JULY 1989 CARLSTADT, NEW JERSEY", AUGUST 4, 1989.

LEGEND

- A / 2 5 — DETAIL OR CROSS SECTION DESIGNATION; FIGURE No. WHERE DETAIL OR CROSS SECTION IS PRESENTED; FIGURE No. WHERE LOCATION OF DETAIL OR CROSS SECTION IS FIRST SHOWN
- GB-01 / 4 ft. NW — BOREHOLE LABEL; PROJECTED DISTANCE; BOTTOM OF BOREHOLE
- FILL
- SLUDGE/FILL
- SLUDGE
- PEAT
- GRAY SILT / BEDDED CLAY (UPPER HORIZON GLACIOLACUSTRINE VARVED CLAY)
- APPROXIMATE GROUNDWATER SURFACE BASED ON AVERAGE WATER LEVEL DATA OBTAINED FROM NEARBY PIEZOMETERS IN JULY 1997

20 0 20
horizontal scale feet

5 0 5
vertical scale feet

101237

JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	DWD	DATE:	10/14/97
CHK BY:	Sam	FILE No.:	NJ03-774
REV BY:		DR SUBTITLE:	13

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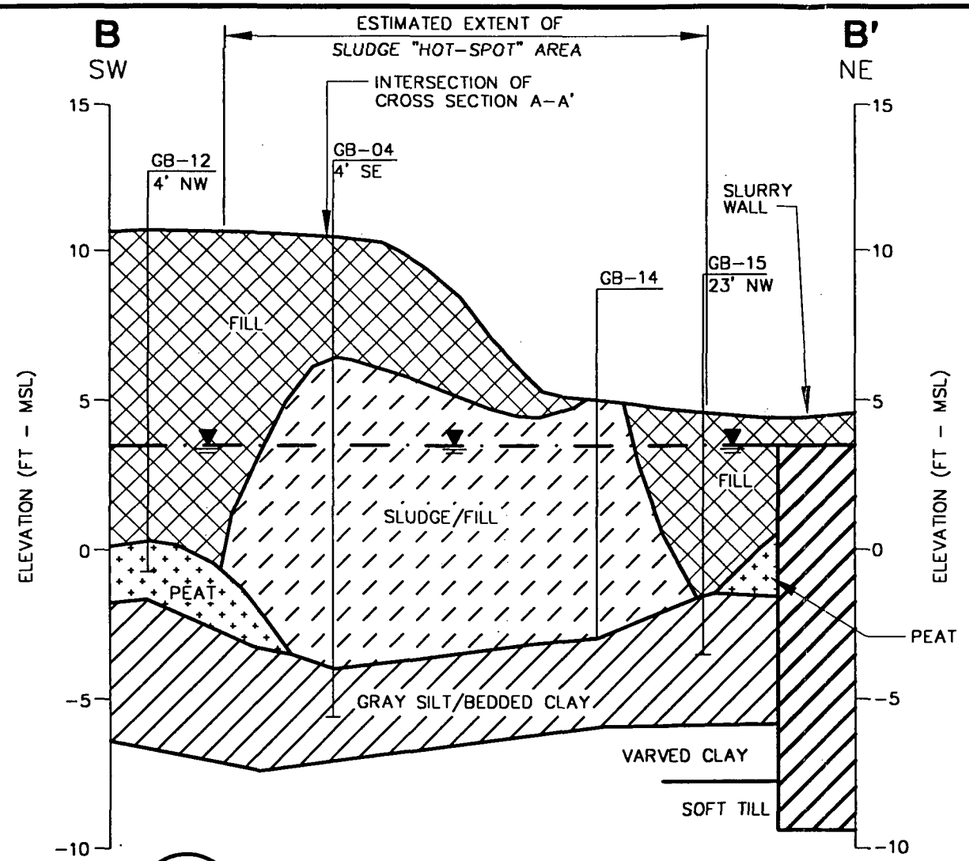
GEOLOGICAL CROSS SECTION A-A'

216 PATERSON PLANK ROAD SITE

FIGURE 4



B 2 5 GEOLOGICAL CROSS SECTION B-B'

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

2.) LOCATION OF SLURRY WALL INVESTIGATION BORINGS AND TEST PIT LOCATIONS ARE APPROXIMATE. BORING & TEST PIT LOCATIONS WERE PREVIOUSLY SURVEYED USING A SITE SPECIFIC COORDINATE SYSTEM.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ IN OCTOBER 1996 AND SOIL BORINGS IN AUGUST 1997.

3.) SLURRY WALL BORINGS AND FEATURES FROM THE INTERIM REMEDIAL MEASURES TAKEN FROM CANONIE ENVIRONMENTAL, 1992 "INTERIM REMEDY FOR FIRST OPERABLE UNIT", AUGUST 1992.

4.) DAMES & MOORE, 1990. "FINAL REPORT - REMEDIAL INVESTIGATION SCP SITE, CARLSTADT, NEW JERSEY", MARCH 1, 1990.

5.) DAMES & MOORE, 1989. - "TEST PIT INVESTIGATION SCP / CARLSTADT JULY 1989 CARLSTADT, NEW JERSEY", AUGUST 4, 1989.

LEGEND

B / 2 5 — DETAIL OR CROSS SECTION DESIGNATION; FIGURE No. WHERE DETAIL OR CROSS SECTION IS PRESENTED; FIGURE No. WHERE LOCATION OF DETAIL OR CROSS SECTION IS FIRST SHOWN

GB-01 / 4 ft. NW — BOREHOLE LABEL; PROJECTED DISTANCE

BOTTOM OF BOREHOLE

FILL

SLUDGE/FILL

PEAT

GRAY SILT / BEDDED CLAY (UPPER HORIZON GLACIOLACUSTRINE VARVED CLAY)

APPROXIMATE GROUNDWATER SURFACE BASED ON AVERAGE WATER LEVEL DATA OBTAINED FROM NEARBY PIEZOMETERS IN JULY 1997

NOV 2 1 1997

20 0 20
horizontal scale feet

5 0 5
vertical scale feet

101238

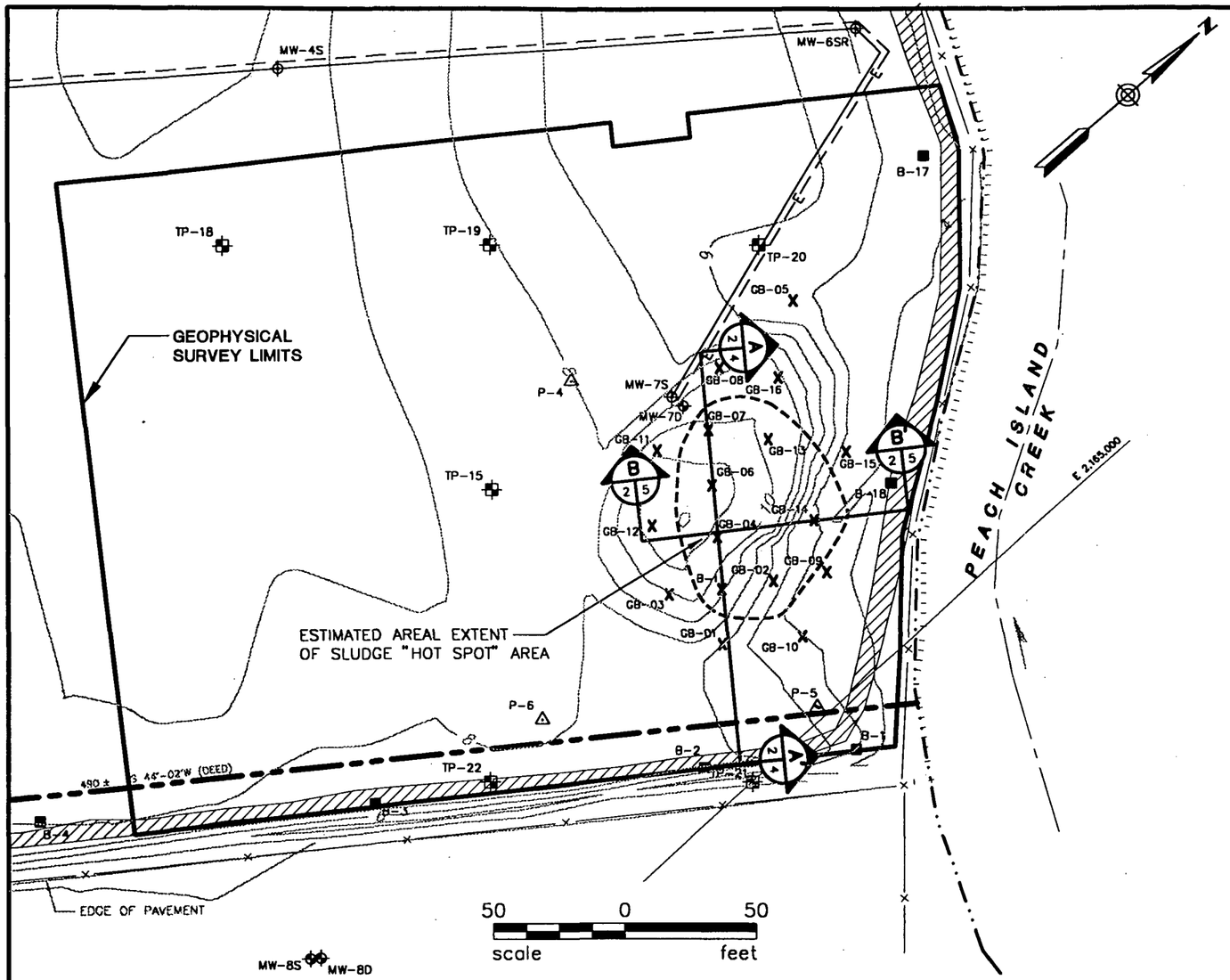
JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	DWD	DATE:	10/14/97
CHK BY:	Som	FILE No.:	NJ03-775
REV BY:		DR SUBTITLE:	13

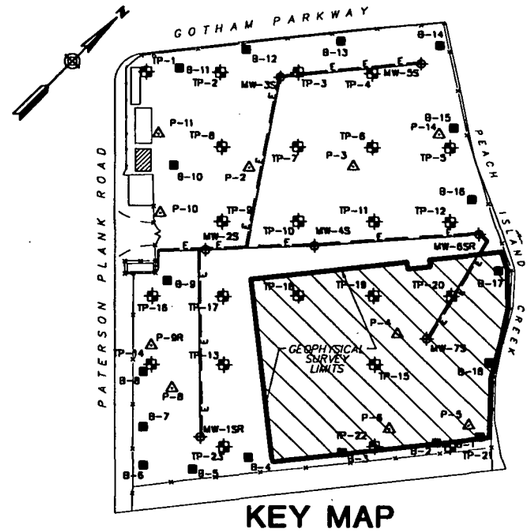
Golder Associates

GEOLOGICAL CROSS SECTION B-B'

216 PATERSON PLANK ROAD SITE

FIGURE 5





NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

2.) LOCATION OF SLURRY WALL INVESTIGATION BORINGS AND TEST PIT LOCATIONS ARE APPROXIMATE. BORING & TEST PIT LOCATIONS WERE PREVIOUSLY SURVEYED USING A SITE SPECIFIC COORDINATE SYSTEM.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

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3.) SLURRY WALL BORINGS AND FEATURES FROM THE INTERIM REMEDIAL MEASURES TAKEN FROM CANONIE ENVIRONMENTAL, 1992 "INTERIM REMEDY FOR FIRST OPERABLE UNIT", AUGUST 1992.

4.) DAMES & MOORE, 1990. "FINAL REPORT – REMEDIAL INVESTIGATION SCP SITE, CARLSTADT, NEW JERSEY", MARCH 1, 1990.

5.) DAMES & MOORE, 1989. – "TEST PIT INVESTIGATION SCP / CARLSTADT JULY 1989 CARLSTADT, NEW JERSEY", AUGUST 4, 1989.

LEGEND

- A / 22 / 43 — DETAIL OR CROSS SECTION DESIGNATION; FIGURE No. WHERE DETAIL OR CROSS SECTION IS PRESENTED; FIGURE No. WHERE LOCATION OF DETAIL OR CROSS SECTION IS SHOWN
- GB-01 X — SOIL BORING LOCATION (COMPLETED AS PART OF THE FFS INVESTIGATION)
- MW-8D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- B-6 — SLURRY WALL CONSTRUCTION INVESTIGATION BORING (INSTALLED DURING REMEDIAL DESIGN)
- TP-2 — TEST PIT (INSTALLED DURING TEST PIT INVESTIGATION)
- PROPERTY/RIGHT-OF-WAY BOUNDARIES
- 1 FT. CONTOUR LINE (FT. – MSL)
- EDGE OF STREAM
- FENCE
- SLURRY WALL ALIGNMENT
- SHEET PILE WALL ALIGNMENT

NOV 2 1 1997

101239

JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	DWD	DATE:	11/21/97
CHK BY:	SDM	FILE No.:	NJ03-746
REV BY:		DR SUBTITLE:	13

Golder Associates

ESTIMATED AREAL EXTENT OF SLUDGE "HOT SPOT" AREA

216 PATERSON PLANK ROAD SITE

FIGURE 6

APPENDIX A

Surface Geophysical Survey Report

APPENDIX A

TABLE OF CONTENTS

LIST OF FIGURES

A1.0 GEOPHYSICAL SURVEY

A1.1 Background

A geophysical survey was carried out 216 Paterson Plank Road Site (Site) in Carlstadt, New Jersey. The purpose of the survey was to assist in determining the approximate extent of areas containing sludge material and debris within the two former pond areas and the B-1 area.

The geophysical survey was carried out over an area of approximately 1.75 acres covering the north-east portion of the site (Figures A1 and A2). The geophysical methods originally proposed for the survey were electromagnetic induction (EM31) and ground penetrating radar (GPR). The EM31 survey was intended to map the areal distribution of apparent conductivity within the survey area with the expectation that the sludge materials would have an apparent conductivity different from the surrounding materials. The GPR survey was intended to profile the thickness of the materials.

After starting the EM31 survey, it became obvious that the materials under the HDPE liner covering the Site were highly conductive and that there was a considerable amount of buried metal present. Notably, the EM31 readings were highest in the area of the former ponds interpreted from the aerial photographs. The lowest recorded apparent conductivity in areas apparently free from the influence of buried metal were on the order of 100 to 120 milli seimens per meter (mS/m), which is high for most natural or undisturbed earth materials. Also, due to the high apparent conductivity of the subsurface materials, it was apparent that the GPR survey would not be effective for profiling since GPR energy is rapidly attenuated in conductive materials.

Based on the early results of the EM31 survey, it was necessary to revise the geophysical investigation as follows:

- complete the EM31 survey to map the distribution of apparent conductivity beneath the HDPE liner and responses (quadrature and inphase) indicative of buried metal
- complete an EM61 survey to clearly identify areas underlain by buried metal objects (possible large metal objects and slabs of reinforced concrete), and
- complete a test with the GPR system to verify the expected lack of depth of investigation.

The investigation was redesigned to use the EM61 response data, which is indicative of buried metal objects, to filter out data from the EM31 data set for those locations where the EM61 readings were in excess of a threshold value. The residual contoured EM31 response data could then be expected to relate only to conductive material free from the response due to buried metal. The interpretation of the data is based on premise that sludge materials are highly conductive (>250 mS/m) compared to the surrounding materials. A detailed discussion of the procedures and interpretations is provided below.

A2.0 INSTRUMENTS

A2.1 Frequency Domain Electromagnetic Induction (GEONICS EM31) Survey

Readings were taken with a GEONICS® EM31 which is an electromagnetic induction device well suited to mapping terrain apparent conductivity and response indicative of buried metal. With the frequency domain electromagnetic induction technique, an alternating current is passed through a wire coil (the transmitter) producing a time-varying magnetic field. This field in turn induces current to flow in any nearby conductor, the ground included. These induced currents produce a secondary time-varying magnetic field which is sensed, together with the primary field, at a receiver coil. The quadrature and inphase components of the secondary field are measured relative to the primary field.

Quadrature Response (Apparent Conductivity)

The quadrature component for the EM31 is primarily designed to be sensitive to materials which have a low induction number, such as earth materials or poorly conducting metallic targets. Typically, the quadrature response is referred to as the apparent conductivity response. For the EM31, quadrature response is calibrated to give a measure of the bulk apparent conductivity of the subsurface for a roughly hemispherical volume of radius 15 feet, centered at the measurement point.

Apparent conductivity is primarily a function of interconnected porosity, clay content, moisture content and the dissolved ion concentration in the pore fluid. Temperature, phase state of the pore water and the amount and composition of any suspended colloids in the pore water also contribute to conductivity but to a lesser degree. An increase in any of these properties would result in an elevated apparent conductivity. Background is estimated as the response from uncontaminated native materials free from the influence of buried or surface metal. Quadrature response is dominated by large positive or negative readings (relative to background) in the near presence of metal conductors, depending on their size, orientation and distribution. Under these conditions, the instrument cannot make a valid measurement of apparent conductivity and the reading can only be considered as an indication of the near presence of highly conductive materials or soils. Instrument output is in mS/m which are units of apparent conductivity.

Inphase Response

The measured inphase component is most sensitive to targets which have a high induction number and are good conductors (primarily larger surface and buried metal objects). As such, the inphase response is sensitive to buried and surface metal and relatively insensitive to changes in apparent conductivity of the subsurface. As with the quadrature response, instrument response can be positive or negative (relative to background) depending on the size, orientation and distribution of the metal objects causing the anomalies. In addition, very highly conductive, non-metallic materials (such the sludge materials thought to be buried in the vicinity of the former pond areas and B-1 area) can produce an anomalous high inphase response. Instrument output for inphase is in parts per thousand (ppt) as a ratio of the secondary to primary field strength.

A2.2 Time Domain Electromagnetic Induction (GEONICS EM61) Survey

Readings were taken with a GEONICS® EM61, a transient electromagnetic (TEM) induction device. This instrument provides response indicative of buried metal within the upper 10 to 12 feet of ground surface with excellent lateral resolution and can be used for mapping buried metal in close proximity (less than 3 to 6 feet) to surface objects such as buildings and fences.

The instrument consists of a transmitter loop (1x1 metre) that generates a pulsed primary magnetic field which in turn induces electrical eddy currents in nearby metallic objects. Decay of these eddy currents is recorded on two 1x1 metre receiver coils mounted together with the transmitter coil at 0.5 and 1 metres above ground surface. The two coils - top and bottom - measure an early and late time earth or secondary response. These data are processed to generate a third response - the differential channel. Typically, the bottom coil and differential channel data are presented for interpretation of the presence of buried metallic objects. The effect of the differential calculation is to remove or filter out instrument response due to shallow and surface scrap metal objects.

For the field work, instrument response was recorded and displayed with an integrated digital data logger. The instrument is equipped with a wheel-mounted counter to trigger data recording for every 0.19 to 0.20 metres of travel.

The EM61 can reliably detect a single 55 gallon drum at depths up to 10 feet in the absence of other surface metal and electrical interference and larger targets (USTs) at shallower depth can be resolved in the near presence of surface metal with some interpretation. An advantage with this technique is that the instrument is insensitive to changes in apparent conductivity of the ground and is relatively insensitive to buried linear conductors such as cables, pipes and ground wires.

A2.3 Ground Penetrating Radar (GSSI SIR System 8) Survey

The ground penetrating radar test survey was completed with the GSSI SIR System 8 and utilizing 120 MHz, 300 MHz and 500 MHz antenna systems.

A GPR system consists of an antenna, a control unit and a computer and/or plotter for displaying the data. The control unit generates a pulse of electrical energy which, when transmitted by the GPR antenna, produces an electromagnetic wave with a central frequency dependent on the characteristics of the antenna. The antenna also acts as a receiver for energy which is subsequently reflected back from subsurface interfaces. The reflections are recorded in time and depth scales derived based on assumed or measured values for the velocity of propagation of radar energy in the subsurface. Reflections occur at interfaces where there is a change in the dielectric permittivity such as sand/clay, soil/rock soil/metal, etc. Reflections can even occur where there is a slight change in the water saturated porosity.

In a GPR survey, the antenna system is moved along a survey line and readings are taken at discrete intervals. If the readings are taken quickly enough, and the antenna is moved slowly, the resultant plot of the data represents a quasi-continuous profile of the subsurface changes in dielectric permittivity.

A3.0 FIELD WORK

A grid was laid out over the survey area to provide a reference for the EM31 and EM61 readings, GPR traverses and possible follow-up intrusive investigation. Care was taken to avoid puncturing the HDPE liner covering the site. Grid lines were laid out at 6 foot intervals and fiducial references were marked at 6 foot intervals. The grid was marked on the liner with fluorescent spray paint and pin-flags taped to the HDPE liner.

EM31 readings were recorded at 3 foot intervals on lines spaced 6 feet apart. The EM61 data were recorded on the same survey line but with readings at 8 inch (0.2 metre) intervals. The GPR test was run along Line 200 W with fiducial marks at 6 foot intervals and quasi-continuous data was recorded for the 120 MHz, 300 MHz and 500 MHz antenna systems.

Readings were recorded in the field on a data logger and then downloaded to a portable computer for plotting and analysis. Field data were prepared and processed using the GEOSOFT® Mapping (2D) Processing System. This system is comprised of a suite of micro-computer programs designed to effectively process data and create high quality presentation maps.

A4.0 RESULTS

The results from the survey are presented on ten figures.

Figures A1 and A2 - show the geophysical survey area (Figure A1) and the instrument reading locations (EM31 and EM61) within the geophysical survey area (Figure A2). The geophysical survey grid was "fitted" to the base map based on observations and chained measurements made at the time of the survey. Accuracy is expected to be on the order of +/- 1 foot.

Figures A3 and A4 - show the color contoured data from the EM61 survey. The bottom coil response data (Figure A3) indicates all of the buried metal (deep and shallow) sensed by the instrument and the differential response data (Figure A4) depicts the location of large buried metal objects at approximate depth greater than 1 foot. Readings in excess of 200 mV (Figure A3) and in excess of 75 mV (Figure A4) indicate the presence of buried metal objects or accumulations of buried metal objects.

Figures A5 and A6 - show the color contoured data from the EM31 survey. The quadrature response or apparent conductivity data (Figure A5) shows the distribution of apparent conductivity for a depth of investigation on the order of 15 feet inclusive of response due to buried metal within 10 feet of ground surface. The inphase response data (Figure A6) typically just shows the distribution of buried metal within 10 feet of ground surface. However, for areas underlain by highly conductive earth materials, the contoured distribution of anomalous inphase response will mimic the contoured quadrature response. The detection limit for buried metal objects is on the order of 10 feet for both the quadrature and inphase response.

Figures A7 and A8 - show the processed color contoured data from the EM31 survey. Processing consisted of removing all readings from the quadrature and inphase response data sets that were apparently affected by buried metal and re-contouring the data in an effort to only show the distribution of high apparent conductivity earth material (inclusive of the materials containing sludge).

The processed inphase response data appear to show a zone of highly conductive materials that may correlate to the location of the former pond areas. The premise is that the materials deposited in the

former pond areas has formed a highly conductive material. This effect has been observed at a number of other sites where used motor oils, and other liquid wastes have been mixed with clayey soils and deposited in landfill sites.

Figure A9 - This figure shows the interpreted distribution of anomalous high apparent conductivity material thought to be associated with the former pond areas and areas that should be clear of buried metal objects (within 10 feet of ground surface). However, it is possible that scrap metal may be encountered in boreholes within the area of anomalous high apparent conductivity.

Figure A10 - The GPR test line data are shown in profile for the 120 MHz, 300 MHz and 500 MHz antenna systems. The depth scales shown are based on an assumed velocity of propagation of radar energy in the subsurface of 0.2 feet per nanosecond and are calibrated to the 10 nanosecond time scale. The sections show dark banding within 10 to 20 nanoseconds of "time zero" and almost complete attenuation of any apparent signal subsequently. This is typical of collecting data over highly conductive ground. The maximum apparent depth of investigation is limited to less than 1 to 2 feet and therefore, these data are not useful for subsurface imaging at this site.

As noted, the apparent conductivity response was anomalously high over much of the site with an apparent background of 100 to 120 mS/m. Terrain apparent conductivity in the vicinity of the former pond areas was very high: in excess of a measured response of 250 mS/m. It is important to note that the EM31 response is non-linear above a response of approximately 120 mS/m and the terrain apparent conductivity of the buried materials in the area of the sludge pit locations is likely much higher.

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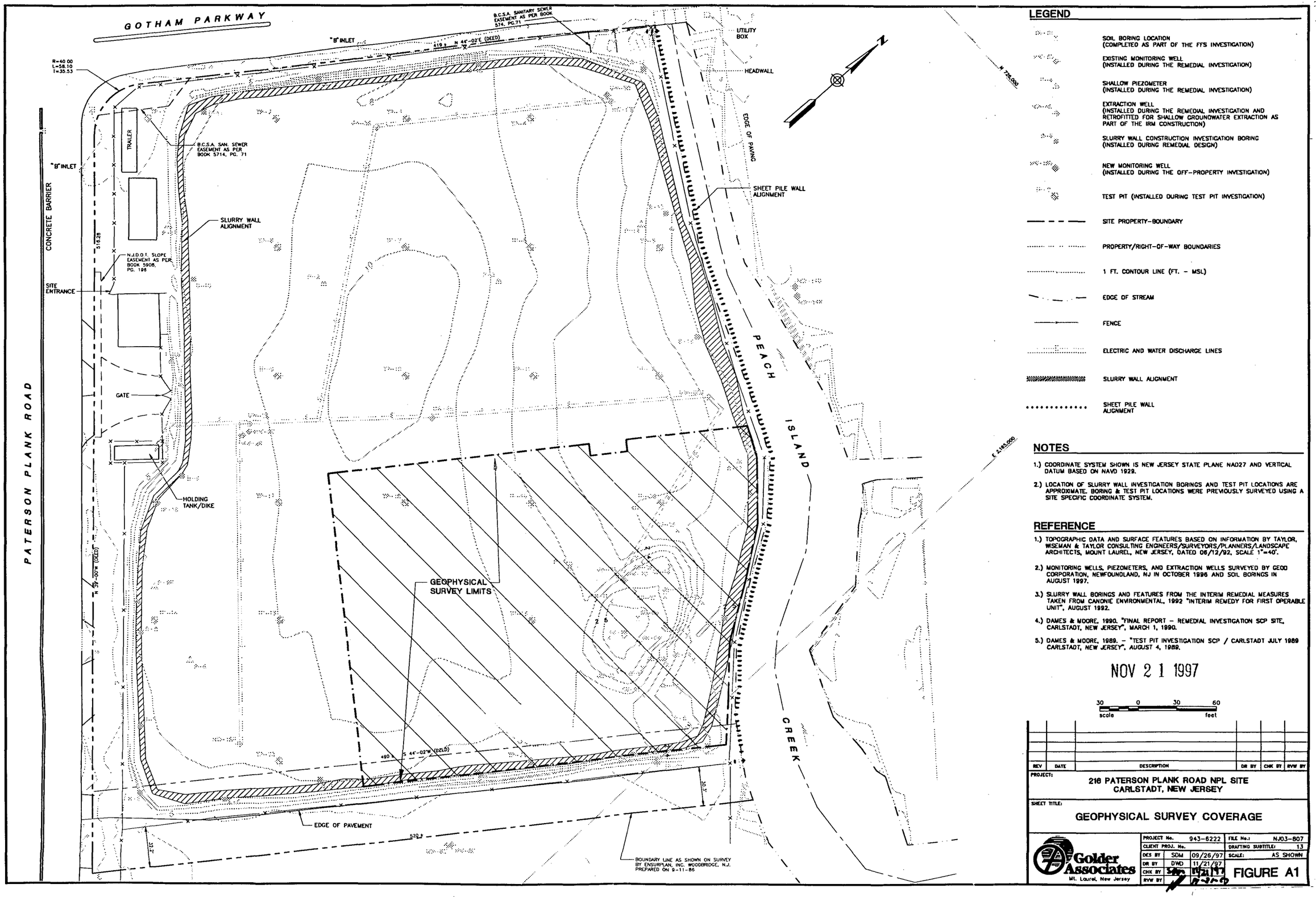


LEGEND

- SOIL BORING LOCATION (COMPLETED AS PART OF THE FFS INVESTIGATION)
- EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- SLURRY WALL CONSTRUCTION INVESTIGATION BORING (INSTALLED DURING REMEDIAL DESIGN)
- NEW MONITORING WELL (INSTALLED DURING THE OFF-PROPERTY INVESTIGATION)
- TEST PIT (INSTALLED DURING TEST PIT INVESTIGATION)
- SITE PROPERTY-BOUNDARY
- PROPERTY/RIGHT-OF-WAY BOUNDARIES
- 1 FT. CONTOUR LINE (FT. - MSL)
- EDGE OF STREAM
- FENCE
- ELECTRIC AND WATER DISCHARGE LINES
- SLURRY WALL ALIGNMENT
- SHEET PILE WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

2.) LOCATION OF SLURRY WALL INVESTIGATION BORINGS AND TEST PIT LOCATIONS ARE APPROXIMATE. BORING & TEST PIT LOCATIONS WERE PREVIOUSLY SURVEYED USING A SITE SPECIFIC COORDINATE SYSTEM.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ IN OCTOBER 1996 AND SOIL BORINGS IN AUGUST 1997.

3.) SLURRY WALL BORINGS AND FEATURES FROM THE INTERIM REMEDIAL MEASURES TAKEN FROM CANONIE ENVIRONMENTAL, 1992 "INTERIM REMEDY FOR FIRST OPERABLE UNIT", AUGUST 1992.

4.) DAMES & MOORE, 1990. "FINAL REPORT – REMEDIAL INVESTIGATION SCP SITE, CARLSTADT, NEW JERSEY", MARCH 1, 1990.

5.) DAMES & MOORE, 1989. – "TEST PIT INVESTIGATION SCP / CARLSTADT JULY 1989 CARLSTADT, NEW JERSEY", AUGUST 4, 1989.

NOV 2 1 1997

30 0 30 60
scale feet

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

PROJECT:
216 PATERSON PLANK ROAD NPL SITE
CARLSTADT, NEW JERSEY

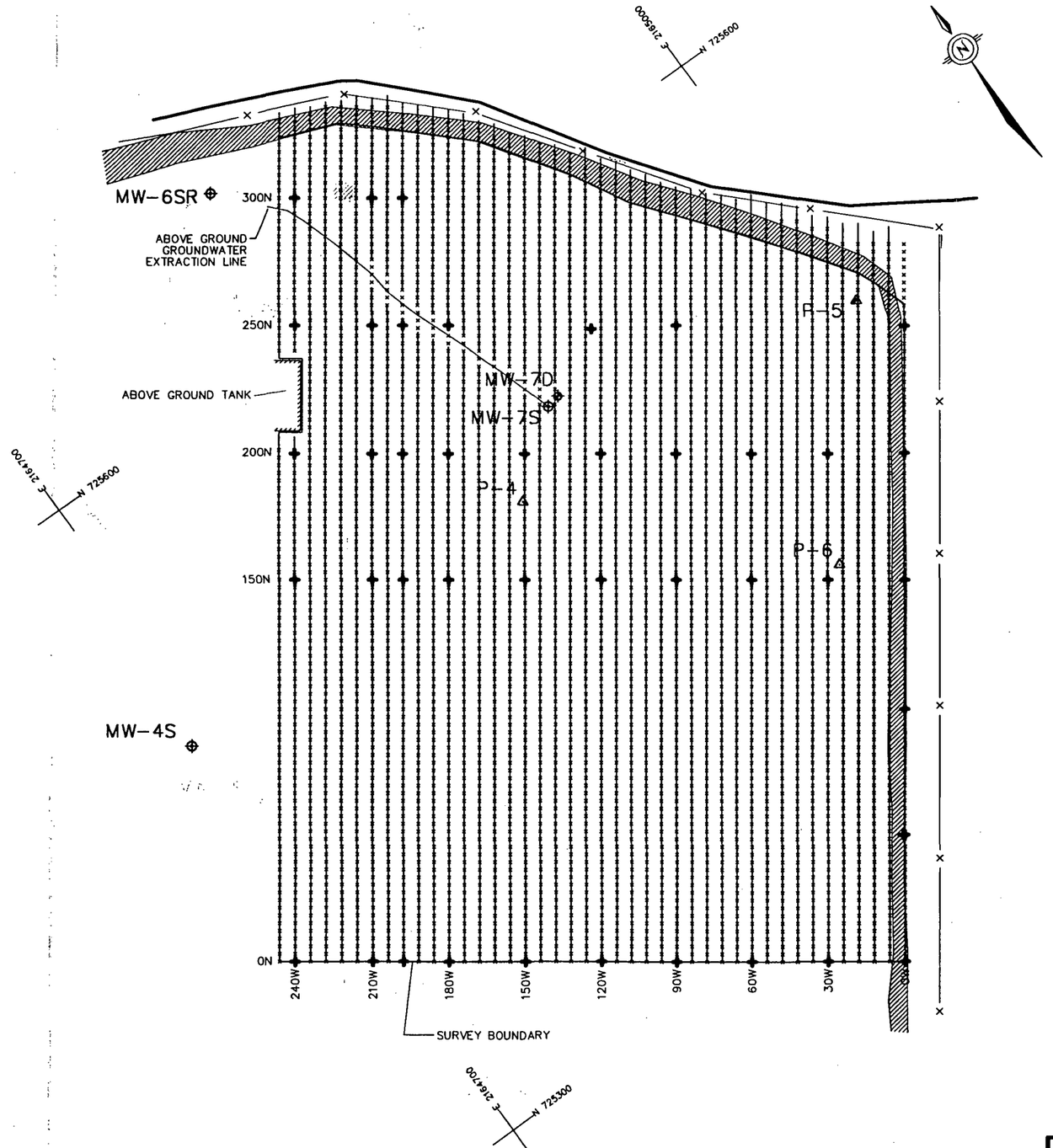
SHEET TITLE:
GEOPHYSICAL SURVEY COVERAGE

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	943-6222		FILE No.:	NJ03-807
CLIENT PROJ. No.			DRAFTING SUBTITLE:	1.3
DES BY	SDM	09/26/97	SCALE:	AS SHOWN
DR BY	DWD	11/21/97		
CHK BY				
RVW BY				

FIGURE A1

101250



LEGEND

- INSTRUMENT READING LOCATIONS
  - EM31
  - EM61
- MW-8D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1996).

NOV 2 1 1997

50 0 50
scale feet

JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	JSG/MMW	DATE:	11/21/97
CHK BY:	[illegible]	FILE No.:	NJ03-806
REV BY:	[illegible]	DR SUBTITLE:	13

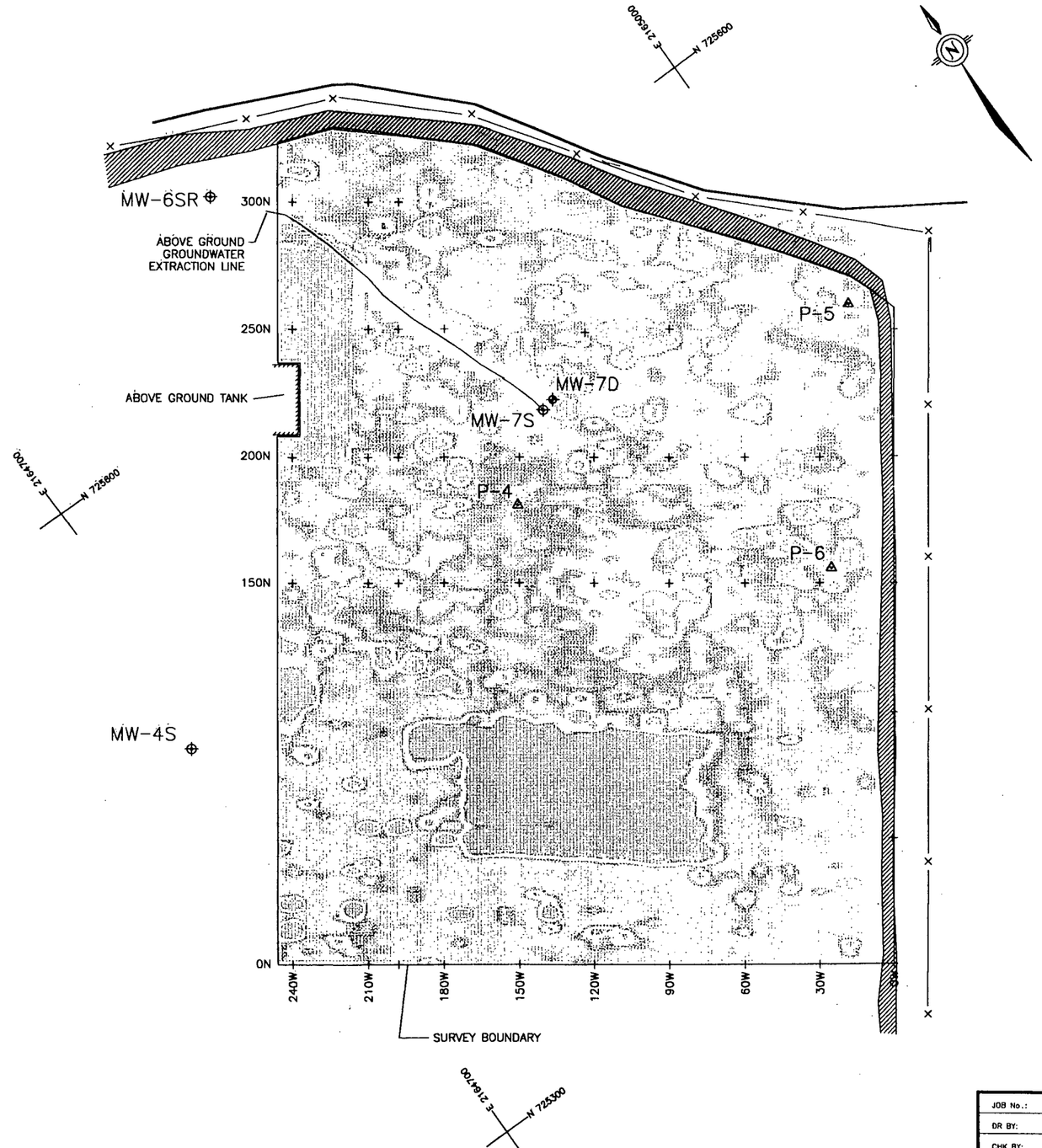
GEOPHYSICAL SURVEY GRID

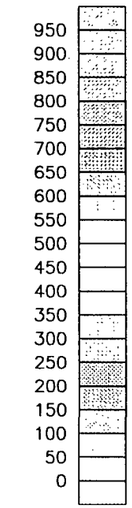
Golder Associates

216 PATERSON PLANK ROAD SITE

FIGURE A2

101251





LEGEND

- MW-6D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

4.) EM61 READING INTERVALS WERE AT 6 FOOT LINE AND 7.85 INCH STATION SPACING.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1998).

50 0 50 100 150

SCALE (ft)

NOV 2 1 1997

JOB No.:	943-6222	SCALE:	1"=50'
DR BY:	JSG/MMW	DATE:	JULY 1997
CHK BY:	SDM	FILE No.	6222-2MW
REV BY:		DR SUBTITLE:	13

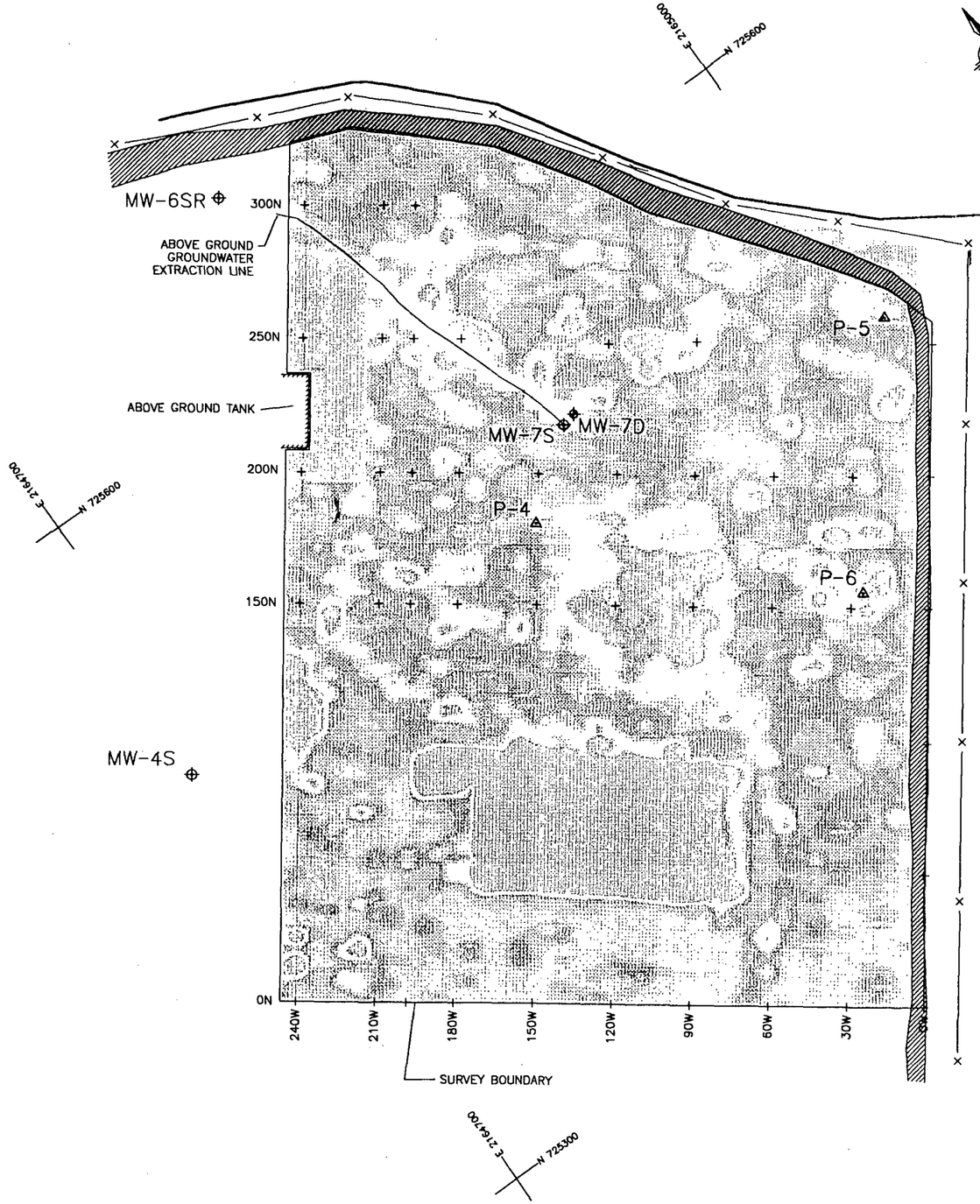
EM61 BOTTOM COIL RESPONSE CONTOURED DATA

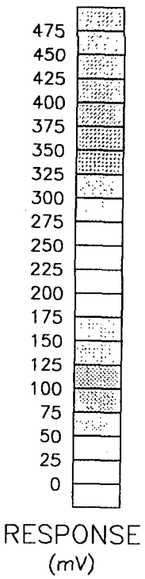
101252

Golder Associates

216 PATERSON PLANK ROAD SITE

FIGURE: A3





LEGEND

- MW-8D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

4.) EM61 READING INTERVALS WERE AT 6 FOOT LINE AND 7.85 INCH STATION SPACING.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1995).

50 0 50 100 150

SCALE (ft)

NOV 2 1 1997

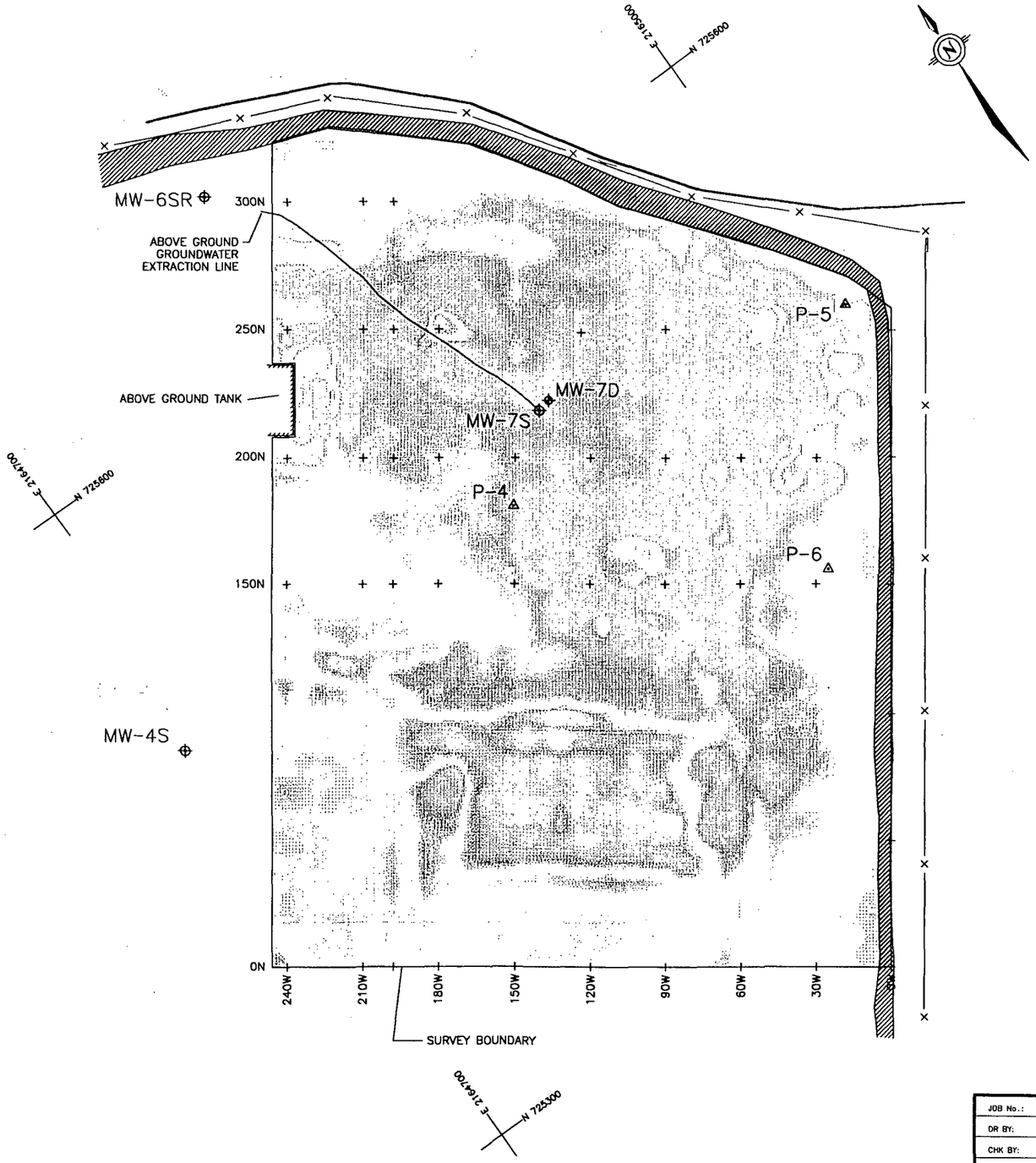
JOB No.:	943-6222	SCALE:	1"=50'
DR BY:	JSG/MMW	DATE:	JULY 1997
CHK BY:	Sam	FILE No.	6222-2MW
REV BY:		DR SUBTITLE:	13

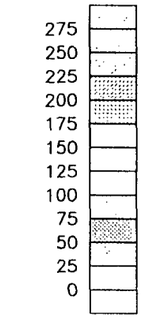
EM61 DIFFERENTIAL RESPONSE CONTOURED DATA 101253

Golder Associates

216 PATERSON PLANK ROAD SITE

FIGURE: A4





QUADRATURE
(mS/m)

LEGEND

- MW-8D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

4.) EM31 READING INTERVALS WERE AT 6 FOOT LINE AND 3 FOOT STATION SPACING.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

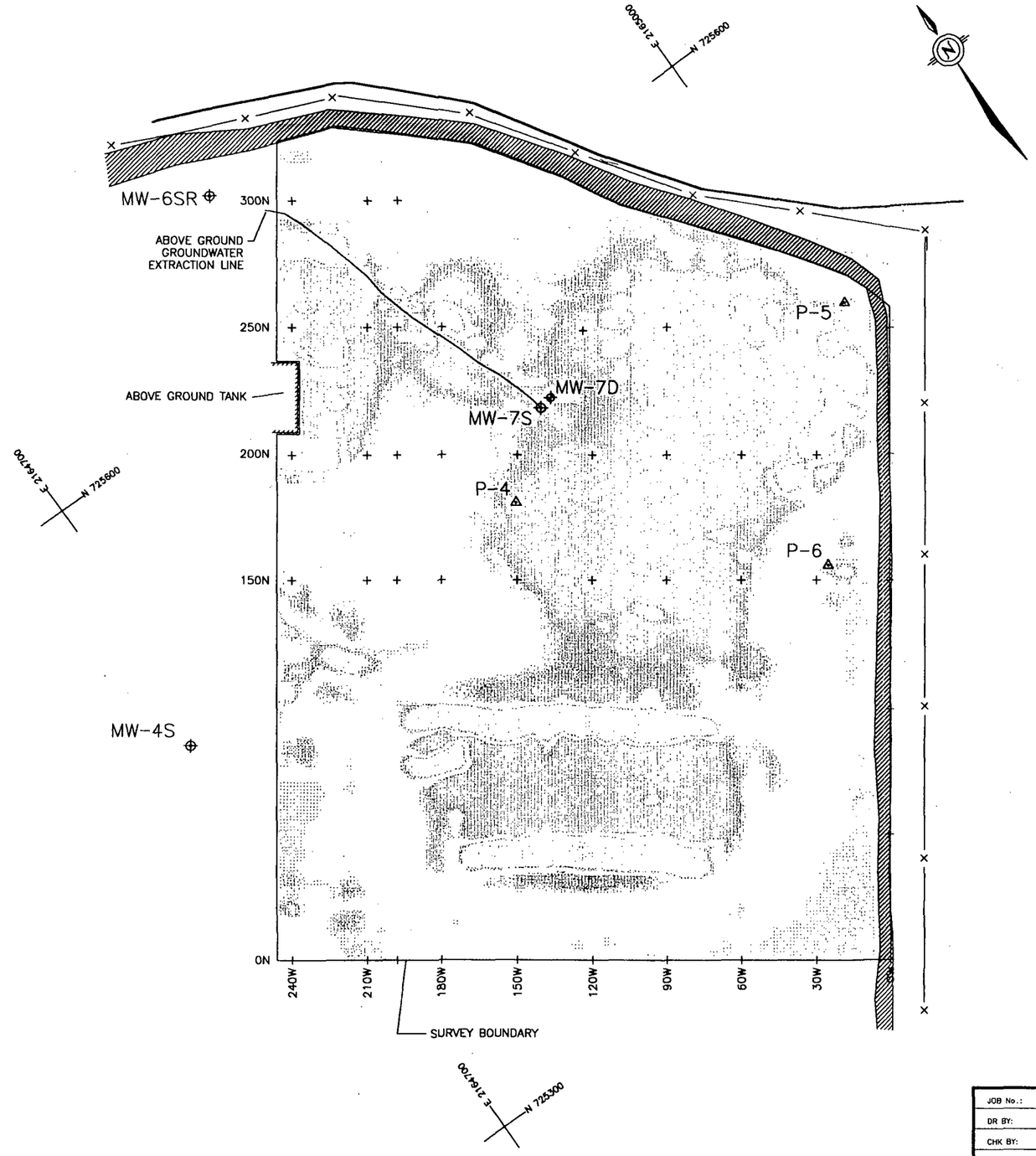
2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1996).

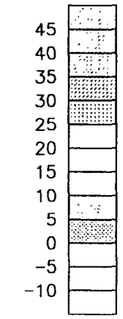
50 0 50 100 150

SCALE (ft)

NOV 21 1997

JOB No.: 943-6222	SCALE: 1"=50'	EM31 QUADRATURE RESPONSE CONTOURED DATA	101254
DR BY: JSG/MMW	DATE: JULY 1997		
CHK BY: sam	FILE No. 6222-2MW		
REV BY:	DR SUBTITLE: 13		
Golder Associates		216 PATERSON PLANK ROAD SITE	FIGURE: A5





INPHASE
(ppt)

LEGEND

- MW-9D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

4.) EM31 READING INTERVALS WERE AT 6 FOOT LINE AND 3 FOOT STATION SPACING.

REFERENCE

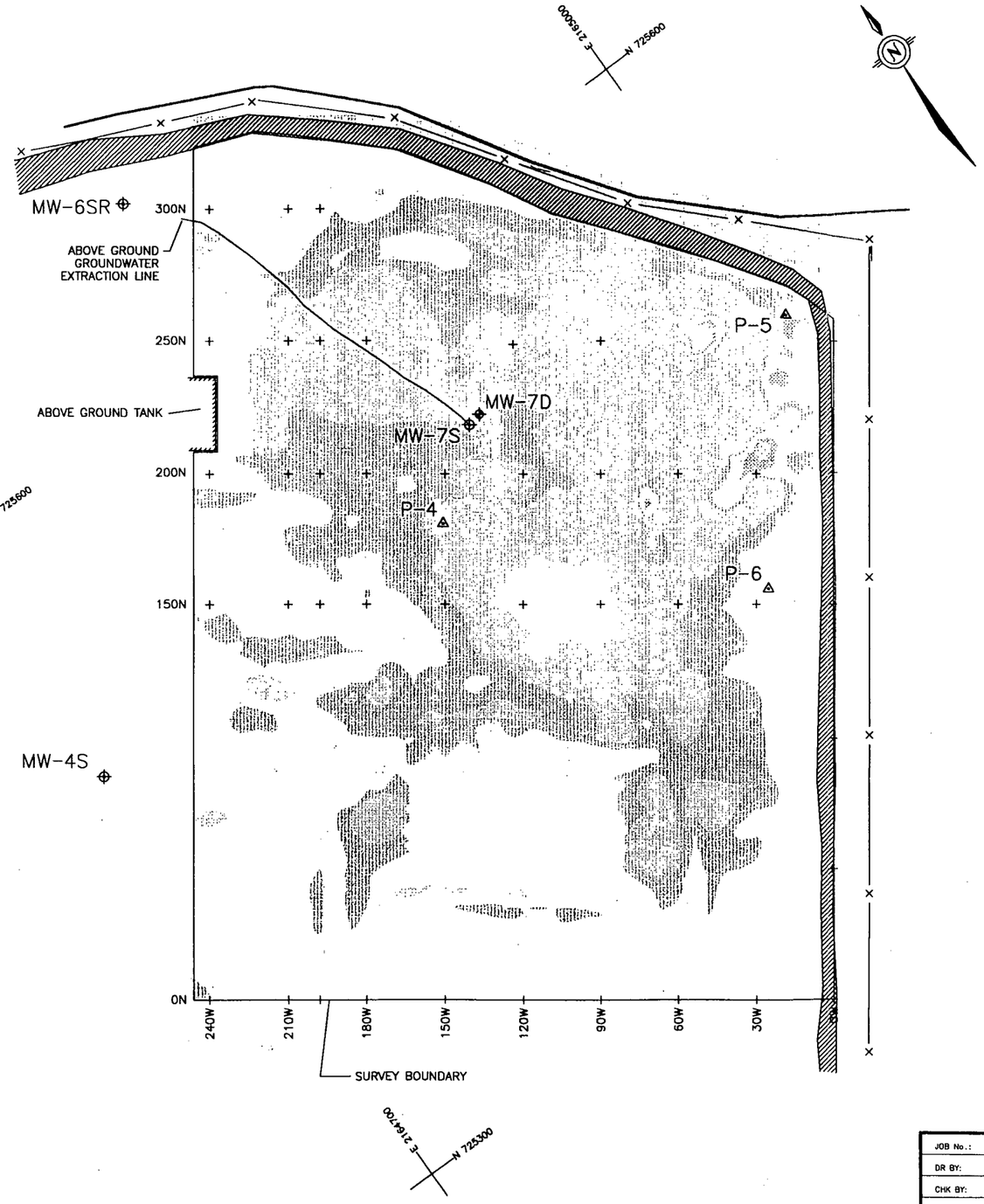
1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1998).

50 0 50 100 150

SCALE (ft)

JOB No.: 943-6222	SCALE: 1"=50'	EM31 INPHASE RESPONSE CONTOURED DATA	101255
DR BY: JSG/MMW	DATE: JULY 1997		
CHK BY: SDW	FILE No. 6222-2MW		
REV BY:	DR SUBTITLE: 13		
Golder Associates		216 PATERSON PLANK ROAD SITE	FIGURE: A6



275
250
225
200
175
150
125
100
75
50
25
0

QUADRATURE
(mS/m)

LEGEND

- MW-6D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

4.) EM31 READING INTERVALS WERE AT 6 FOOT LINE AND 3 FOOT STATION SPACING.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1996).

50 0 50 100 150

SCALE (ft)

NOV 2 1 1997

JOB No.:	943-6222	SCALE:	1"=50'
DR BY:	JSG/MMW	DATE:	JULY 1997
CHK BY:	Sam	FILE No.	6222-2MW
REV BY:		DR SUBTITLE:	13

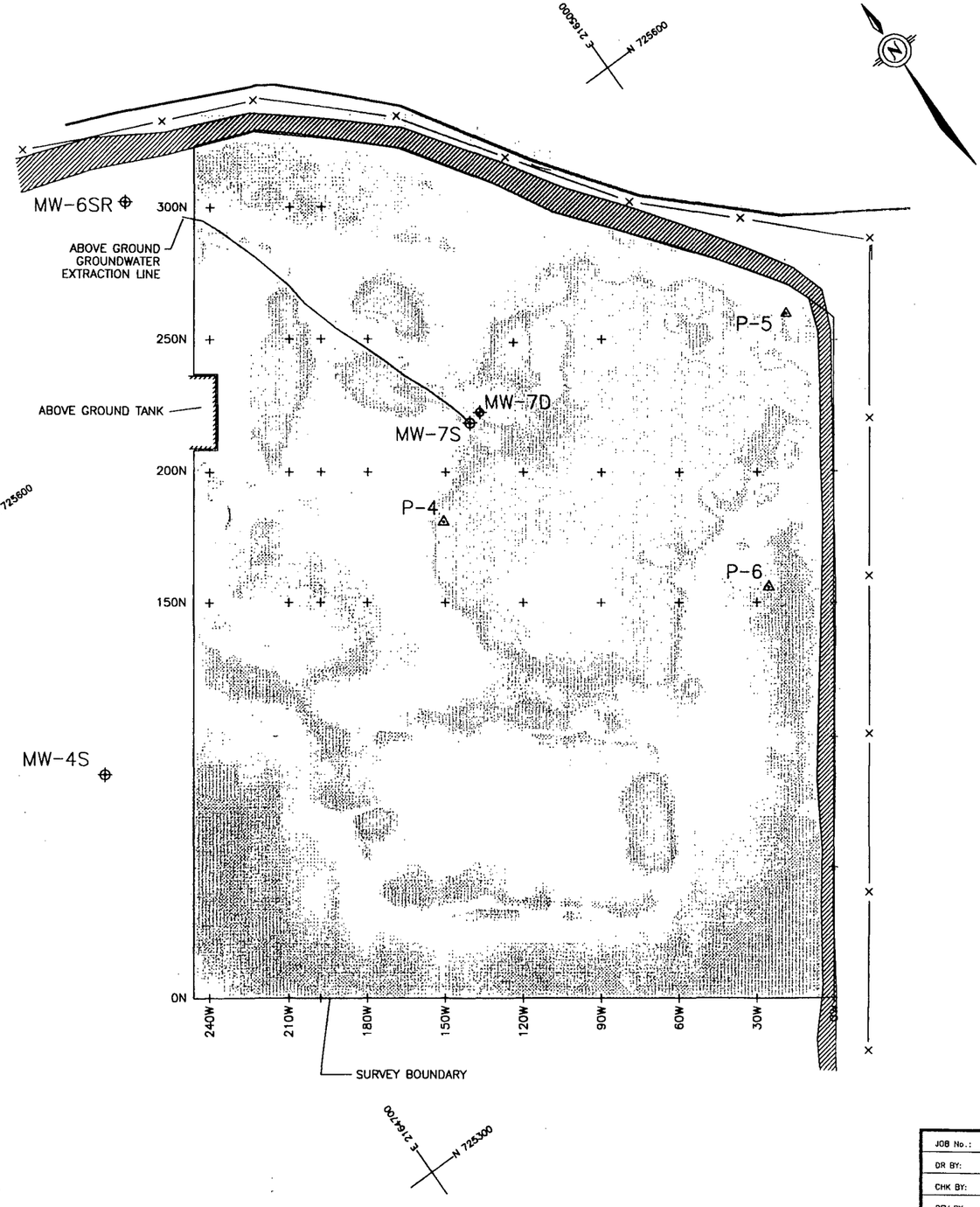
EM31 QUADRATURE RESPONSE
CONTOURED DATA – "METAL RESPONSE REMOVED"

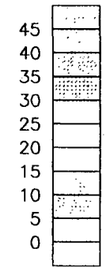
Golder Associates

216 PATERSON PLANK ROAD SITE

FIGURE: A7

101256





LEGEND

- MW-8D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

4.) EM31 READING INTERVALS WERE AT 6 FOOT LINE AND 3 FOOT STATION SPACING.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1998).

50 0 50 100 150

SCALE (ft)

NOV 21 1997

JOB No.:	943-6222	SCALE:	1"=50'
DR BY:	JSG/MMW	DATE:	JULY 1997
CHK BY:	SAM	FILE No.	6222-2MW
REV BY:		DR SUBTITLE:	13

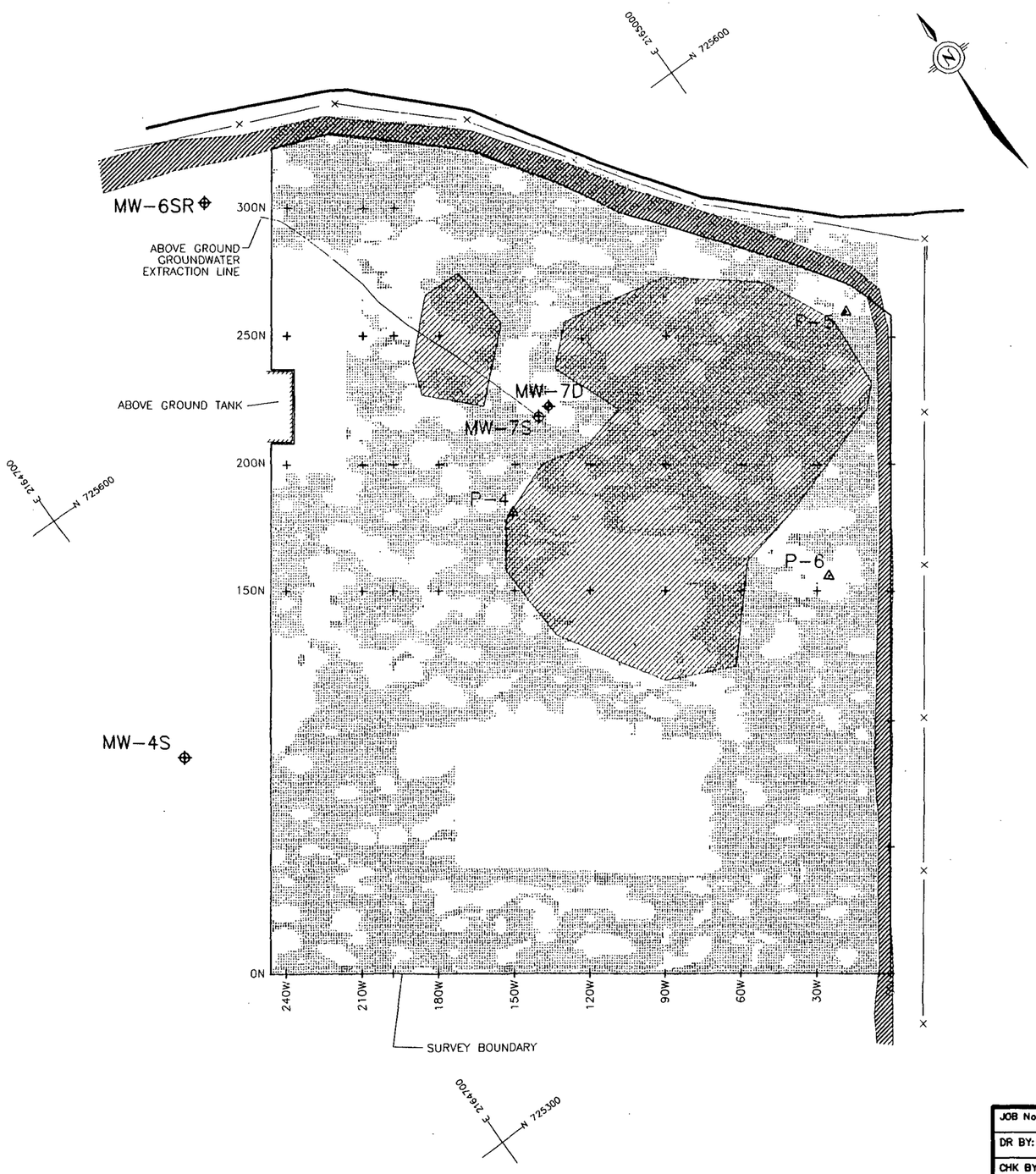
EM31 INPHASE RESPONSE
CONTOURED DATA – "METAL RESPONSE REMOVED"

Golder Associates

216 PATERSON PLANK ROAD SITE

FIGURE: A8

101257



LEGEND

- INTERPRETED SLUDGE AREA (AREA INTERPRETED AS UNDERLAIN BY HIGH APPARENT CONDUCTIVITY MATERIAL – NOT INCLUDING LARGE METAL OBJECTS)
- AREAS INTERPRETED AS CLEAR FOR DRILLING (AREAS INTERPRETED AS CLEAR OF LARGE BURIED METAL OBJECTS WITHIN 10 FEET OF GROUND SURFACE)
- MW-6D — EXISTING MONITORING WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 — SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-4S — EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- 200N + — FLAGGED GEOPHYSICAL SURVEY GRID LOCATIONS AND GRID CO-ORDINATES
- STREAM
- FENCE
- SLURRY WALL ALIGNMENT

NOTES

1.) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.

REFERENCE

1.) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISEMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.

2.) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOD CORPORATION, NEWFOUNDLAND, NJ (OCTOBER 1996).

50 0 50
scale feet

JOB No.:	943-6222	SCALE:	AS SHOWN
DR BY:	JSG/MMW	DATE:	11/21/97
CHK BY:	SDM	FILE No.:	NJ03-805
REV BY:		DR SUBTITLE:	13

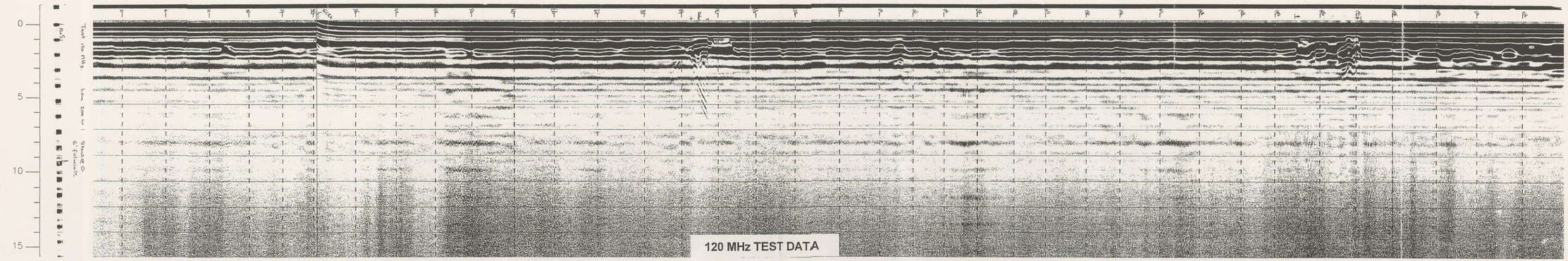
Golder Associates

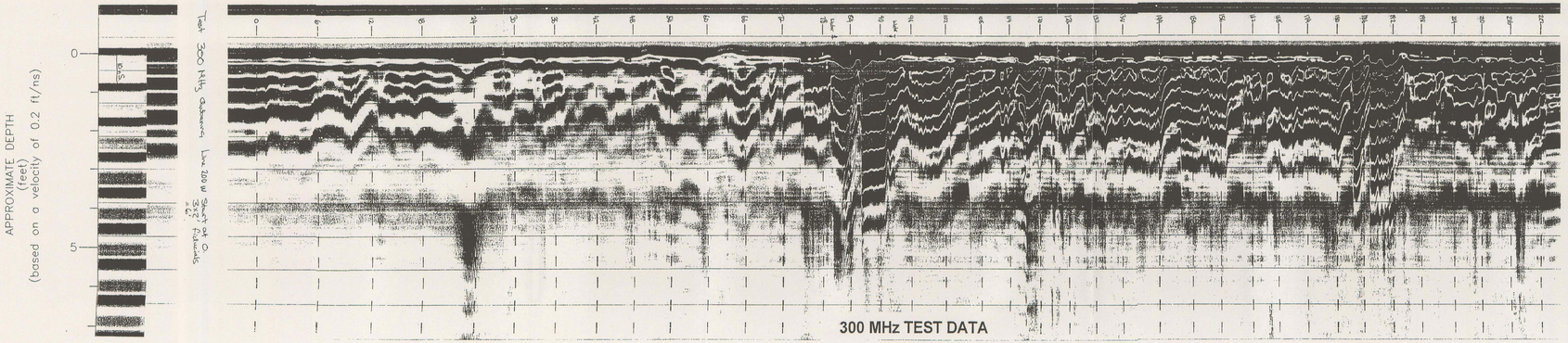
INTERPRETED EM DATA FOR SLUDGE DISTRIBUTION AND DRILLING CLEARANCE

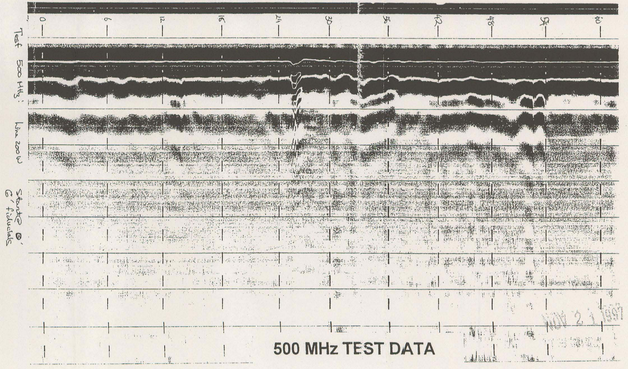
216 PATERSON PLANK ROAD SITE

FIGURE A9

101258







NOTES

1.) FIDUCIALS ARE MARKED AT 6 FOOT INTERVALS ACROSS THE TOP OF THE RECORDS. THE APPROXIMATE HORIZONTAL SCALE IS 10 TO 15 FEET PER INCH.

2.) THE DEPTH SCALES ARE BASED ON AN ASSUMED RADAR VELOCITY IN THE SUB-SURFACE OF 0.2 FEET PER NANO-SECOND.

3.) THE MAXIMUM APPARENT DEPTH OF INVESTIGATION FOR THE RADAR DATA IS APPROXIMATELY 2 FEET.

JOB No.: 943-6222	SCALE: 1"=50'	GROUND PENETRATING RADAR SECTION LINE 200 - 120, 300 AND 500 MEGAHERTZ DATA	
DR BY: JSG/MMW	DATE: JULY 1997		
CHK BY: SDM	FILE No.: 6222-2MW		
REV BY: RL	DR SUBTITLE: 10		
Golder Associates	216 PATERSON PLANK ROAD SITE		FIGURE: A10

101259

APPENDIX B

Borehole Logs

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE B-1

BORING START: 08-06-97

BORING LOCATION: N 725478.6 E 2164938.7

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					8.99							
0	3 1/4" ID H.S.A.	0.0-4.0 ft. Stiff to firm, dark brown SILTY CLAY, trace sand, trace gravel. From 3.0-4.0 ft. black organic silty clay (fibrous) with some pieces of wood present.			0.00	B-1A	DO	3,4,5,4	9	12"/24"	PID READINGS 0-2 ft. 162.0 ppm	
						B-1B	DO	4,4,2,4	6	18"/24"	2-4 ft. 450.0 ppm	
					4.99							
5		4.0-8.0 ft. Hard, dark brown and black predominately SILTY CLAY consisting of debris material up to 2-inches in diameter, including rocks, red brick, and pieces of rubber. (FILL)			4.00	B-1C	DO	13,14,18,18	32	18"/24"	4-6 ft. 96.0 ppm	
						B-1D	DO	4,3,23	N/A	N/A	6-8 ft. No data.	
					0.99							
		8.0-10.5 ft. Stiff, brown, organic, fibrous PEAT.	PT		8.00	B-1E	DO	7,5,7,9	12	22"/24"	8-10 ft. 162.0 ppm	
10					-1.51							
		10.5-17.0 ft. Light grey with yellow-brown mottling, some greenish coloring, CLAYEY SILT.			10.50	ST-01	ST	N/A	N/A	18"/27"		
			ML			B-1F	DO	7,11	N/A	12"/12"	13-14 ft. 50.0 ppm	
15						ST-02	ST	N/A	N/A	27"/27"		
					-8.01							
		BORING TERMINATED AT 17.0 FT. BELOW GROUND SURFACE. Description of materials from 10.5-17.0 ft. based on material present at end of each Shelby Tube sample (ST-01 and ST-02) and one split spoon sample taken from 13.0-14.0 ft.			17.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 11-21-97

101261

PROJECT: CARLSTADT/FAC. COORD./NJ

RECORD OF BOREHOLE GB-01

SHEET: 1 OF 1

PROJECT LOCATION: CARLSTADT, NEW JERSEY

BORING START: 08-08-97

DATUM: MSL

PROJECT NUMBER: 943-6222

BORING LOCATION: N 725464.8 E 2164954.1

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					7.11							
0	3 1/4" ID H.S.A.	0.0-7.8 ft. Hard SILTY CLAY and CLAYEY SILT mixed with debris consisting of red brick, concrete, wood, and slag. From 4.0-7.8 ft. poor sample recovery (sample consisted primarily of rock fragments ranging from a silt to coarse gravel and saturated with a black viscous liquid). Pieces of debris up to 2.5 inches in diameter. (FILL)			0.00	1A	DO	50,26,17,17	43	20"/24"	PID READINGS 0-2 ft. 0.3 ppm	
						1B	DO	30,35,41,45	76	24"/24"	2-4 ft. 23.0 ppm	
5						1C	DO	14,27,30,18	57	6"/24"	4-6 ft. 1.7 ppm	
						1D	DO	5,4,3,2	7	2"/24"	6-8 ft. 1.0 ppm	
					-0.69							
		7.8-8.5 ft. Firm, brown, organic, fibrous PEAT.	PT									
					8.50							
10		8.5-11.0 ft. Brown CLAYEY SAND.	SC			ST-05	ST	N/A	N/A	10"/27"		
					-3.89							
		BORING TERMINATED AT 11.0 FT. BELOW GROUND SURFACE. Description of materials from 8.5-11.0 ft. based on material present at end of Shelby Tube sample ST-05.			11.00							
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

LOGGED: S. MITCHELL

CHECKED:

DATE: 11-21-97

Golder Associates

101262

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-02

BORING START: 08-07-97

BORING LOCATION: N 725495.2 E 2164949.5

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
0	3 1/4" ID H.S.A.				6.84							
		0.0-2.7 ft. Stiff, brown SILTY CLAY with pieces of red brick. (FILL)			0.00	2A	DO	12,6,5,2	11	2"/24"	PID READINGS 0-2 ft. 0.0 ppm	
					4.14							
		2.7-4.0 ft. Firm, black SLUDGE (grease-like consistency).			2.70	2B	DO	4,3,2,2	5	12"/24"	2-4 ft. 850.0 ppm	
					2.84							
5		4.0-7.0 ft. Very stiff, brown SLUDGE. From 5.0-6.0 ft. brown sludge mixed with a black, granular material, pieces of rubber and wood material.			4.00	2C	DO	2,13,13,13	26	24"/24"	4-6 ft. 300.0 ppm	
		7.0-7.4 ft. Black, rubberized material.			-0.16	2D	DO	N/A	N/A	24"/24"	6-8 ft. 810.0 ppm	
		7.4-11.0 ft. Brown and black, organic, fibrous PEAT grading to black fines, some fine sand, trace gravel.	PT		7.40	ST-03	ST	N/A	N/A	27"/27"		
10					-4.16							
		11.0-15.0 ft. Grey and dark grey CLAYEY SILT grading to a light olive brown SILTY CLAY, little sand, trace gravel.	CL		11.00	2E	DO	N/A	N/A	12"/12"		
						ST-04	ST	N/A	N/A	27"/27"		
15					-8.16							
		BORING TERMINATED AT 15.0 FT. BELOW GROUND SURFACE. Description of materials from 8.5-15.0 ft. based on grain size analysis of material collected in samples ST-03 and ST-04 and physical description of material collected from split spoon sample taken from 11.0-12.0 ft.			15.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 11-21-97

101263

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-03

BORING START: 08-08-97

BORING LOCATION: N 7254652.4 E 2164926.8

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					10.24							
0	3 1/4" ID H.S.A.	0.0-8.0 ft. Hard, brown CLAYEY SILT with pieces of plastic and red brick (approximately up to 30% of material consisted of debris).			0.00	3A	DO	5,7,10,15	17	20"/24"	PID READINGS 0-2 ft. 75.0 ppm	
						3B	DO	10,38,29,17	67	24"/24"	2-4 ft. 39.0 ppm	
5						3C	DO	8,10,14,38	24	24"/24"	4-6 ft. 96.0 ppm	
		5.6-6.0 ft. Reddish-brown slag-like material interlayered with plastic sheeting. (FILL)				3D	DO	60/0	N/A	N/A	6 ft. Split spoon refusal.	
					2.24							
		8.0-10.0 ft. Compact, black, medium SAND with pieces of stone up to 2 inches in diameter. Material saturated with a black, viscous liquid.			8.00	3E	DO	17,10,9,11	19	4"/24"	8-10 ft. 40.0 ppm	
10					0.24							
		10.0-12.0 ft. Firm, brown, organic, fibrous PEAT. (PT)			10.00	3F	DO	4,4,4,4	8	2"/24"	10-12 ft. 40.0 ppm	
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101264

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-04

BORING START: 08-11-97

BORING LOCATION: N 725490.5 E 2164923.1

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					10.50							
0	3 1/4" ID H.S.A.	0.0-4.0 ft. Stiff to firm, brown CLAYEY SILT and SILTY CLAY with pieces of red brick, wood, plastic, and rubber. (FILL)			0.00	4A	DO	4,3,8,3	11	6"/24"	PID READINGS 0-2 ft. 338.0 ppm	
						4B	DO	2,2,3,2	5	22"/24"	2-4 ft. 854.0 ppm	
					6.50							
5		4.0-6.0 ft. Very stiff, black SLUDGE mixed with a fine grained soil (grease-like consistency).			4.00	4C	DO	1,3,17,4	20	2"/24"	4-6 ft. 854.0 ppm	
					4.50							
		6.0-7.5 ft. Firm, black SLUDGE (grease-like consistency).			6.00	4D	DO	3,3,2,2	5	18"/24"	6-8 ft. 554.0 ppm	
					3.00							
		7.5-8.0 ft. Firm, brown SLUDGE with pieces of glass.			7.50							
		8.0-10.0 ft. Soft, light brown and yellow-brown SILTY CLAY with some pieces of wood present. (FILL)			8.00	4E	DO	3,2,2,3	4	24"/24"	8-10 ft. 754.0 ppm	
					0.50							
10		10.0-12.6 ft. Soft to firm, black SILTY CLAY and black SLUDGE with some pieces of wood, glass, and peat material. (FILL/ SLUDGE)			10.00	4F	DO	3,4,4,4	8	24"/24"	10-12 ft. 834.0 ppm	
					-2.10							
		12.6-13.3 ft. Dense, black SILTY SAND.	SM		12.60	4G	DO	4,21,14,14	35	24"/24"	12-14 ft. 74.0 ppm	
		13.3-14.0 ft. Dense SILTY SAND and light brown and yellow-brown CLAYEY SILT.	SM-ML		13.30							
					14.00							
15		14.0-14.8 ft. Hard, black and brown SANDY SLUDGE.	ML		14.80	4H	DO	6,12,21,21	33	24"/24"	14-16 ft. 424.0 ppm	
		14.8-16.0 ft. Hard, light grey and yellow-brown CLAYEY SILT.			-5.50							
					16.00							
		BORING TERMINATED AT 16.0 FT. BELOW GROUND SURFACE.										
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101265

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-05

BORING START: 08-13-97

BORING LOCATION: N 725571.2 E 2164876.3

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					5.17							
0	3 1/4" ID H.S.A.	0.0-7.3 ft. Hard to firm, dark brown CLAYEY SILT and SILTY CLAY, some fine sand, trace to little coarse gravel with pieces of red brick and glass present (Pieces of debris up to 1.5 inches in diameter). (FILL)			0.00	5A	DO	21,21,13,19	34	24"/24"	PID READINGS 0-2 ft. 0.0 ppm	
						5B	DO	19,14,13,12	27	3"/24"	2-4 ft. 0.0 ppm	
5						5C	DO	4,3,4,6	7	24"/24"	4-6 ft. 0.0 ppm	
					-2.13	5D	DO	12,5,8,10	13	24"/24"	6-8 ft. No data.	
		7.3-10.0 ft. Stiff to hard, greenish-grey and yellow-brown SILTY CLAY, CLAYEY SILT, and CLAYEY SAND.	ML-CL		7.30	5E	DO	12,13,22,21	35	N/A	8-10 ft. 12.0 ppm	
10		BORING TERMINATED AT 10.0 FT. BELOW GROUND SURFACE.			-4.83 10.00							
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101266

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-06

BORING START: 08-11-97

BORING LOCATION: N 725502.0 E 2164907.2

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					11.54							
0	3 1/4" ID H.S.A.	0.0-1.8 ft. Firm to stiff, brown CLAYEY SILT with pieces of red brick. (FILL)			0.00	6A	DO	5,4,4,3	8	11"/24"	PID READINGS 0-2 ft. 35.0 ppm	
					9.74							
		1.8-2.2 ft. Firm to stiff, brown SLUDGE, mixed with soil from 2.0-2.3 ft.			1.80							
		2.2-4.0 ft. Stiff, dark brown and black SILTY CLAY with pieces of red brick and glass (medium sand from 2.2-2.4 ft.). (FILL)			2.20	6B	DO	7,5,6,7	11	24"/24"	2-4 ft. 75.0 ppm	
					7.54							
5		4.0-8.0 ft. Firm, black and brown SLUDGE, some fine sand. Organic peat material also present in sample.			4.00	6C	DO	3,3,2,1	5	24"/24"	4-6 ft. 834.0 ppm	
						6D	DO	5,3,2,4	5	24"/24"	6-8 ft. 834.0 ppm	
					3.54							
		8.0-12.0 ft. Very stiff to stiff, black SILTY CLAY and CLAYEY SILT, trace to some medium to coarse sand. Pieces of rubber, red brick, glass, wood, and cardboard present. From 8.0-10.0 ft., possible presence of black sludge material. Material had a grease-like consistency. (FILL)			8.00	6E	DO	7,11,7,7	18	5"/24"	8-10 ft. 146.0 ppm	
10						6F	DO	7,7,4,5	11	5"/24"	10-12 ft. 254.0 ppm	
					-0.46							
		12.0-13.6 ft. Stiff, black SILTY CLAY, some fine sand and peat material.	OL-PT		12.00	6G	DO	12,5,4,3	9	20"/24"	12-14 ft. 360.0 ppm	
					-2.06							
		13.6-14.0 ft. Stiff, dark grey CLAYEY SILT.	ML		13.60							
15		BORING TERMINATED AT 14.0 FT. BELOW GROUND SURFACE.			14.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101267

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-07

BORING START: 08-12-97

BORING LOCATION: N 725515.0 E 2164890.9

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					10.66							
0	3 1/4" ID H.S.A.	0.0-7.0 ft. Very stiff to firm, brown and black SILTY CLAY and CLAYEY SILT with pieces of red brick, wood, and glass. Some pieces of debris up to 2.5 inches in diameter. At approximately 1.6-2.0 ft. dark red, slag-like material (slightly brittle) with a green discoloration on surface and small flecks of copper colored material. (FILL)			0.00	7A	DO	3,3,6,7	9	8"/24"	PID READINGS 0-2 ft. 220.0 ppm	
						7B	DO	9,8,9,5	17	17"/24"	2-4 ft. 240.0 ppm	
5						7C	DO	3,3,3,2	6	N/A	4-6 ft. No recovery.	
					3.66	7D	DO	5,3,3,4	6	20"/24"	6-8 ft. 834.0 ppm	
		7.0-8.0 ft. Firm, black, organic PEAT, some silty clay.	PT-CL		7.00 2.66							
		8.0-12.4 ft. Firm to very stiff, black PEAT and brown and black SLUDGE. From 11.0-11.2 ft. dark brown SLUDGE, some glass and rubber debris also present.			8.00	7E	DO	3,2,2,3	4	22"/24"	8-10 ft. 840.0 ppm	
10						7F	DO	N/A	N/A	16"/24"	10-12 ft. 840.0 ppm	
		12.4-13.4 ft. Very stiff, light brown CLAYEY SILT, some vegetative matter present.	ML		-1.74 12.40 -2.74	7G	DO	4,7,10,11	17	23"/24"	12-14 ft. 840.0 ppm	
		13.4-14.0 ft. Compact, light brown, silty, fine SAND.	SM		13.40							
15		BORING TERMINATED AT 14.0 FT. BELOW GROUND SURFACE.			14.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101268

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-08

BORING START: 08-13-97

BORING LOCATION: N 725533.7 E 2164876.4

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					8.43							
0	3 1/4" ID H.S.A.	0.0-11.4 ft. Stiff to hard, dark brown, grey, and black CLAYEY SILT and SILTY CLAY and debris consisting of red brick, rubber, slag, wood, wire, glass, cardboard, and metal. Debris up to 2-inches in diameter. From 0.0-4.0 ft. some difficulty drilling - rig chatter. From 6.0-8.0 ft. some peat material present. (FILL)			0.00	8A	DO	3,5,10,25	15	13"/24"	PID READINGS 0-2 ft. 22.0 ppm	
						8B	DO	18,9,13,21	22	N/A	2-4 ft. No recovery.	
5						8C	DO	18,36,38,28	74	12"/24"	4-6 ft. 307.0 ppm	
						8D	DO	14,8,7,8	15	13"/24"	6-8 ft. 518.0 ppm	
						8E	DO	19,110/6"	>110	6"/12"	8-9 ft. 490.0 ppm	
10		11.4-12.0 ft. Compact to dense grey and yellow-brown, silty, fine SAND and CLAYEY SILT.	SM-ML		-2.97 -3.57	8F	DO	6,20,12,19	32	20"/24"	10-12 ft. 290.0 ppm	
		12.0-14.0 ft. Grey with yellow-brown and reddish-brown coloring bedded CLAYEY SAND and CLAYEY SILT, some vegetative material present.	SC-ML		12.00 -5.57	8G	DO	N/A	N/A	24"/24"	12-14 ft. 400.0 ppm	
15		BORING TERMINATED AT 14.0 FT. BELOW GROUND SURFACE.			14.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101269

PROJECT: CARLSTADT/FAC. COORD./NJ

RECORD OF BOREHOLE GB-09

SHEET: 1 OF 1

PROJECT LOCATION: CARLSTADT, NEW JERSEY

BORING START: 08-14-97

DATUM: MSL

PROJECT NUMBER: 943-6222

BORING LOCATION: N 725512.2 E 2164960.4

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					4.60							
0	3 1/4" ID H.S.A.	0.0-4.0 ft. Dense, fine SAND, some coarse gravel. Pieces of red brick and asphalt present. (Encountered a black, viscous liquid at 2.0 ft.) (FILL)			0.00	9A	DO	6,13,11,52	24	N/A	PID READINGS 0-2 ft. No recovery.	
						9B	DO	25,22,9,2	31	12"/24"	2-4 ft. 120.0 ppm	
					0.60							
		4.0-5.0 ft. Very stiff, brown, organic, fibrous PEAT.	PT		4.00 -0.40	9C	DO	5,8,12,8	20	24"/24"	4-6 ft. 130.0 ppm	
5		5.0-8.0 ft. Very stiff to stiff, dark grey and grey SANDY CLAY, some vegetative material present.	CL		5.00	9D	DO	3,5,7,9	12	12"/24"	6-8 ft. 20.0 ppm	
					-3.40							
		BORING TERMINATED AT 8.0 FT. BELOW GROUND SURFACE.			8.00							
10												
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101270

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-10

BORING START: 08-14-97

BORING LOCATION: N 725489.2 E 2164972.2

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					5.02							
0	3 1/4" ID H.S.A.	0.0-3.5 ft. Predominantly debris material consisting of pieces of brick and plastic. Pieces of material ranging in size from fines to coarse gravel (up to 2.5 inches in diameter). A black, viscous liquid was encountered 1.5 ft. bgs. Approximately 30-40 percent of material consisted of material greater than one-half inch in diameter. (FILL)			0.00	10A	DO	11,50,61,40	111	21"/24"	PID READINGS 0-2 ft. 15.0 ppm	
					1.52	10B	DO	26,17,5,3	22	20"/24"	2-4 ft. 20.0 ppm	
5		3.5-6.0 ft. Stiff, brown, organic, fibrous PEAT. Grey, silty clay and peat encountered from 4.0-5.5 ft. Peat saturated with a black, viscous liquid.	PT		3.50 -0.98	10C	DO	3,5,4,3	9	23"/24"	4-6 ft. 20.0 ppm	
		6.0-8.5 ft. Grey CLAYEY SAND.	SC		6.00 -3.48	ST-07	ST	N/A	N/A	27"/27"		
		BORING TERMINATED AT 8.5 FT. BELOW GROUND SURFACE. Description of material from 6.0-8.5 ft. based on material present at end of Shelby Tube sample ST-07.			8.50							
10												
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 11-21-97

101271

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-11

BORING START: 08-14-97

BORING LOCATION: N 725495.1 E 2164883.5

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					11.12							
0	3 1/4" ID H.S.A.	0.0-10.0 ft. Stiff to hard, brown and black SILTY CLAY and debris consisting of concrete, red brick, asphalt, glass, wire, and wood. Approximately 30 percent of debris greater than one-half inch in diameter. Some pieces up to 2 inches in diameter. At 4.0-6.0 ft. dense, clayey sand. (FILL) At 7.0 ft. difficulty drilling - rig chatter.			0.00	11A	DO	12,6,5,21	11	20"/24"	PID READINGS 0-2 ft. 30.0 ppm	
						11B	DO	N/A	N/A	N/A	2-4 ft. 0.0 ppm	
5						11C	DO	12,13,23,46	36	17"/24"	4-6 ft. 0.0 ppm	
						11D	DO	70,28,44,28	72	2"/24"	6-8 ft. 28.0 ppm	
					1.12	11E	DO	17,10,12,11	22	N/A	8-10 ft. No recovery.	
10		10.0-12.0 ft. Compact, black, fine to coarse SAND, little fine to coarse gravel. Black, viscous liquid encountered.	SW		10.00	11F	DO	17,11,3,2	14	2"/24"	10-12 ft. 94.0 ppm	
					-0.88							
		12.0-13.6 ft. Very stiff, light grey and yellow-brown CLAYEY SILT. Vegetative materil present.	ML		12.00	11G	DO	7,6,15,14	21	22"/24"	12-14 ft. 136.0 ppm	
					-2.48							
		13.6-14.0 ft. Compact, grey and black, silty, fine SAND.	SM		13.60							
15		BORING TERMINATED AT 14.0 FT. BELOW GROUND SURFACE.			14.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101272

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-12

BORING START: 08-15-97

BORING LOCATION: N 725474.8 E 2164903.2

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					11.41							
0	3 1/4" ID H.S.A.	0.0-11.0 ft. Hard, dark brown SILTY CLAY and CLAYEY SILT, little medium to coarse sand. Pieces of wood, plastic, asphalt, and glass (up to 2.5 inches in diameter present). At 5.2-5.4 ft. reddish-brown, granular material with plastic. At 6.0-8.0 ft. black, granular material with pieces of red brick up to 2 inches in *diameter present. At 10.0-11.0 ft.* compact, black clayey sand and fine gravel with pieces of wood and glass present. (FILL)			0.00	12A	DO	7,7,100/3"	>100	10"/15"	PID READINGS 0-1.3 ft. 30.0 ppm	
						12B	DO	10,14,27,45	41	N/A	2-4 ft. No recovery.	
5						12C	DO	9,18,15,25	33	22"/24"	4-6 ft. 49.0 ppm	
						12D	DO	21,42,31,26	73	22"/24"	6-8 ft. 68.0 ppm	
						12E	DO	8,9,11,18	20	16"/24"	8-10 ft. 118.0 ppm	
10					0.41							
		11.0-12.0 ft. Stiff, brown, organic, fibrous PEAT.	PT		11.00 -0.59	12F	DO	11,6,5,4	11	22"/24"	10-12 ft. 90.0 ppm	
		BORING TERMINATED AT 12.0 FT. BELOW GROUND SURFACE.			12.00							
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101273

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-13

BORING START: 08-15-97

BORING LOCATION: N 725529.5 E 2164908.6

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					9.76							
0	3 1/4" ID H.S.A.	0.0-4.6 ft. Firm, black and brown CLAYEY SILT, trace to little medium to coarse sand. Pieces of red brick, wood, glass, and slag present. Some pieces of debris up to 1.5 inches in diameter. (FILL)			0.00	13A	DO	4,4,4,7	8	21"/24"	PID READINGS 0-2 ft. 85.0 ppm	
						13B	DO	7,6,13,5	19	7"/24"	2-4 ft. 135.0 ppm	
					5.16							
5		4.6-8.3 ft. Black and brown SLUDGE. Pieces of red brick and glass present.			4.60	13C	DO	4,4,3,2	7	14"/24"	4-6 ft. 205.0 ppm	
						13D	DO	76,44,35,50/2"	79	20"/20"	6-7.6 ft. 145.0 ppm	
					1.46	13E	DO	100/4"	>100	4"/4"	8-8.3 ft. 250.0 ppm	
		8.3 ft. Split spoon refusal. Difficulty drilling from 8.0-9.0 ft. *due to rig chatter.*			8.30							
10					-0.74	13F	DO	100/6"	>100	N/A	No recovery - auger refusal.	
		SPLIT SPOON AND AUGER REFUSAL AT 10.5 FT. BELOW GROUND SURFACE.			10.50							
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101274

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-14

BORING START: 08-15-97

BORING LOCATION: N 725521.6 E 2164942.8

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					5.04							
0	3 1/4" ID H.S.A.	0.0-2.0 ft. Soft, brown SILTY CLAY mixed with brown SLUDGE, trace to little medium to coarse sand.			0.00 3.04	14A	DO	5,2,2,3	4	6"/24"	PID READINGS 0-2 ft. 109.0 ppm	
		2.0-6.5 ft. Very soft to firm, brown SLUDGE. Plastic material mixed with sludge from 4.0-5.7 ft. At 5.7-6.0 ft. and 6.3-6.5 ft. very loose, black, silty, fine sand.			2.00	14B	DO	1,1,1,2	2	24"/24"	2-4 ft. 50.0 ppm	
5						14C	DO	1,1,2,5	3	24"/24"	4-6 ft. 155.0 ppm	
		6.5-8.0 ft. Firm, dark grey SILTY CLAY with vegetative matter present. Small zones saturated with a black, viscous liquid.	CL		-1.46 6.50 -2.96	14D	DO	6,6,7,12	13	24"/24"	6-8 ft. 12.0 ppm	
		BORING TERMINATED AT 8.0 FT. BELOW GROUND SURFACE.			8.00							
10												
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

Golder Associates

101275

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-15

BORING START: 08-15-97

BORING LOCATION: N 725547.9 E 2164931.5

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					4.55							
0	3 1/4" ID H.S.A.	0.0-2.0 ft. Very stiff, dark brown SILTY CLAY, trace to little fine to coarse sand. Several large pieces of red brick up to 1.5 inches in diameter present. Pieces of wood also present. (FILL)			0.00	15A	DO	6,14,12,60/0"	26	18"/18"	PID READINGS 0-1.5 ft. 27.0 ppm	
					2.55							
		2.0-6.0 ft. Dense, brown-black, fine to coarse SAND, little to and fine to coarse gravel, trace to little fines. Difficulty drilling at 2.0 ft. due to rig chatter. Very poor sample recovery - 3 inch diameter rock wedged in opening of split spoon taken from 2.0-4.0 ft. Majority of split spoon samples (2.0-4.0 and 4.0-6.0 ft.) filled with a black, viscous liquid.	SW		2.00	15B	DO	16,16,16,21	32	2"/24"	2-4 ft. 0.0 ppm	
5						15C	DO	10,16,17,5	33	10"/24"	4-6 ft. 66.0 ppm	
					-1.45							
			CL		6.00	15D	DO	5,10,11,10	21	20"/24"	6-8 ft. 46.0 ppm	
		6.0-8.0 ft. Very stiff, greenish-grey and yellow-brown SILTY CLAY. Vegetative matter present.			-3.45							
					8.00							
10		BORING TERMINATED AT 8.0 FT. BELOW GROUND SURFACE.										
15												
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101276

PROJECT: CARLSTADT/FAC. COORD./NJ

PROJECT LOCATION: CARLSTADT, NEW JERSEY

PROJECT NUMBER: 943-6222

RECORD OF BOREHOLE GB-16

BORING START: 08-18-97

BORING LOCATION: N 725547.9 E 2164893.9

SHEET: 1 OF 1

DATUM: MSL

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 in	N	REC/ATT	REMARKS	PIEZOMETER OR STANDPIPE INSTALLATION
					9.71							
0	3 1/4" ID H.S.A.	0.0-13.9 ft. Hard to stiff, brown and black CLAYEY SILT and SANDY CLAY. Pieces of red brick, wire, and glass present. Pieces of debris up to 2 inches in diameter. (FILL)			0.00	16A	DO	10,8,5,7	13	12"/24"	PID READINGS 0-2 ft. No data.	
						16B	DO	10,17,55,35	72	18"/24"	2-4 ft. 94.0 ppm	
5		At 3.6-4.0 ft. concrete material.				16C	DO	16,25,29,90	54	14"/24"	4-6 ft. 0.0 ppm	
						16D	DO	50/1"	>50	N/A	6-6.1 ft. No recovery - split spoon refusal.	
						16E	DO	8,11,11,10	22	3"/24"	8-10 ft. 0.0 ppm	
10						16F	DO	13,8,10,11	18	1"/24"	10-12 ft. 0.0 ppm	
						16G	DO	8,7,8,13	15	18"/24"	12-14 ft. 4.7 ppm	
					-4.19							
15		13.9-16.0 ft. Stiff to hard, greenish-grey and yellow-brown CLAYEY SILT grading to a light red silty clay.	ML		13.90	16H	DO	44,45,33,35	78	12"/24"	14-16 ft. No data.	
					-6.29							
		BORING TERMINATED AT 16.0 FT. BELOW GROUND SURFACE.			16.00							
20												
25												
30												
35												
40												

DRILL RIG: MOBILE B-57 ATV

DRILLING CONTRACTOR: AQUIFER DRILLING & TEST.

DRILLER: T. PRESSIMONE

Golder Associates

LOGGED: S. MITCHELL

CHECKED:

DATE: 10-07-97

101277

APPENDIX C

Air Monitoring Results

Air Monitoring Results
216 Paterson Plank Road Site
Carlstadt, NJ

Contaminant: Total Hydrocarbons
Instrumentation: PID

DATE	Sample Location	Sample Type	Results (ppm)
8/6/97	Prep Table	Breathing Zone	450
8/6/97	Drill Rig	Sample hole	160
8/7/97	Drill Rig	Sample hole	160
8/7/97	Prep Table	Sample	850
8/8/97	Outside Exclusion Zone	Perimeter	0
8/8/97	Outside Exclusion Zone	Perimeter	0
8/8/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Prep Table	Sample	650
8/12/97	Outside Exclusion Zone	Perimeter	0
8/12/97	Prep Table	Sample	723
8/12/97	Outside Exclusion Zone	Perimeter	0
8/13/97	Outside Exclusion Zone	Perimeter	0
8/13/97	Outside Exclusion Zone	Perimeter	0
8/14/97	Prep Table	Perimeter	0
8/14/97	Drill Rig	Perimeter	0
8/14/97	Drill Rig	Perimeter	0
8/14/97	Prep Table	Perimeter	0
8/15/97	Drill Rig	Perimeter	0
8/15/97	Prep Table	Perimeter	16
8/15/97	Drill Rig	Perimeter	0
8/15/97	Drill Rig	Perimeter	0
8/15/97	Prep Table	Perimeter	11.7
8/15/97	Outside Exclusion Zone	Perimeter	0
8/15/97	Outside Exclusion Zone	Perimeter	0

943-6222airdata.xls

Air Monitoring Results
216 Paterson Plank Road Site
Carlstadt, NJ

Contaminant: Total Hydrocarbons
Instrumentation: FID (OVA) (1)

DATE	Sample Location	Sample Type	Results (ppm)
8/6/97	Prep Table	Breathing Zone	10
8/6/97	Drill Rig	Sample hole	100
8/7/97	Prep Table	Sample	660
8/8/97	Outside Exclusion Zone	Perimeter	0
8/8/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/11/97	Outside Exclusion Zone	Perimeter	0
8/12/97	Outside Exclusion Zone	Perimeter	0
8/12/97	Outside Exclusion Zone	Perimeter	0 (2)

NOTES:
(1) FID used to detect chlorinated comounds
(2) Meter not holding H2S gas

943-6222airdata.xls

Air Monitoring Results
216 Paterson Plank Road Site
Carlstadt, NJ

Contaminant: Vinyl Chloride
Instrumentation: Vinyl Chloride Tubes

DATE	Sample Location	Sample Type	Results (ppm)	OSHA PEL (ppm)
8/6/97	Prep Table	Breathing Zone	2	1
8/6/97	Prep Table	Breathing Zone	6	1
8/6/97	Prep Table	Breathing Zone	10	1
8/7/97	Drill Rig	Breathing Zone	< 0.25	1
8/7/97	Drill Rig	Sample hole	2	1
8/7/97	Prep Table	Sample	6	1
8/8/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/8/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/11/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/11/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/12/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/13/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/14/97	Prep Table	Perimeter	< 0.25	1
8/15/97	Prep Table	Perimeter	< 0.25	1
8/18/97	Outside Exclusion Zone	Perimeter	< 0.25	1
8/18/97	Prep Table	Perimeter	< 0.25	1

943-6222airdata.xls

Air Monitoring Results
216 Paterson Plank Road Site
Carlstadt, NJ

Contaminant: Benzene
Instrumentation: Benzene tubes

DATE	Sample Location	Sample Type	Results (ppm)	OSHA PEL (ppm)
8/6/97	Prep Table	Breathing Zone	< 0.5	1
8/8/97	Prep Table	Sample	< 0.5	1
8/12/97	Outside Exclusion Zone	Perimeter	< 0.5	1
8/13/97	Prep Table	Breathing Zone	< 0.5	1

943-6222airdata.xls

Air Monitoring Data
216 Paterson Plank Road Site
Carlstadt, NJ

Contaminant: Mercury
Instrumentation: Jerome Mercury Analyzer

DATE	Sample Location	Sample Type	Results (mg/m3)	OSHA PEL (mg/m3)
8/6/97	Drill Rig	Inside hole	0.28 (1)	0.1
8/6/97	Drill Rig	Breathing zone	0.018 (2)	0.1
8/6/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/7/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/7/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/8/97	Drill Rig	Breathing zone	0.06	0.1
8/8/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/8/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/11/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/11/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/11/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/11/97	Drill Rig	Breathing zone	0.00	0.1
8/12/97	Drill Rig	Breathing zone	0.00	0.1
8/12/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/12/97	Outside Exclusion Zone	Perimeter	0.00	0.1
8/13/97	Outside Exclusion Zone	Perimeter	0.00	0.1
08/13/97	Outside Exclusion Zone	Perimeter	0.00	0.1

NOTES:
(1) Measurements were taken inside hole and results do not reflect breathing zone TWA
(2) Measurements taken directly following interior hole sample

Air Monitoring Results
216 Paterson Plank Road Site
Carlstadt, NJ

Contaminant: **Methylene Chloride**
Instrumentation: **Methylene chloride tubes**

DATE	Sample Location	Sample Type	Results (ppm)	OSHA PEL (ppm)
8/6/97	Drill Rig	Breathing zone	0.00	25
8/6/97	Drill Rig	Sample hole	0.00	25
8/6/97	Outside Exclusion Zone	Perimeter	0.00	25
8/12/97	Outside Exclusion Zone	Perimeter	0.00	25
8/13/97	Outside Exclusion Zone	Perimeter	0.00	25
8/15/97	Drill Rig	Breathing zone	0.00	25

943-6222airdata.xls

APPENDIX D

Validation Narrative

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LIST OF TABLES

1.0 INTRODUCTION

Analytical samples collected between August 5 through August 18, 1997 at the 216 Paterson Plank Road Site in Carlstadt, New Jersey have been validated as part of the Focused Feasibility Study Investigation (FFSI). The samples were collected as specified by the approved Final Focused Feasibility Study Investigation (Investigation) Work Plan, (Golder Associates, 1997). The sample points chosen for analysis and the parameters which were analyzed are described in the Sampling, Analysis and Monitoring Plan (SAMP), Appendix C and the Quality Assurance Project Plan (QAPjP), Appendix D of the Investigation Work Plan.

The samples were analyzed for the Inorganic Target Analyte List (TAL) excluding cyanide, in accordance with the U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration; and the Organic Target Compound List (TCL) in accordance with the Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration for Volatiles Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs) and Pesticides/PCBs. In addition to the TCL and TAL analyses, the samples collected as part of the Investigation were analyzed for total organic carbon (TOC) and oil and grease (O&G), hereafter referenced as Inorganic List Parameters. The samples were also collected and analyzed for pH, moisture content and grain size. The TCL/TAL and inorganic list parameters analyses were initially performed by CompuChem Environmental (CompuChem) of Cary, North Carolina (sample point B-1B and rinsate blank RFF01). However, due to problems encountered by overnight courier services caused by the UPS strike, it was necessary to contract a local laboratory for the remaining analytical services during this investigation. Therefore, Accutest of Dayton, New Jersey performed the remaining analyses, except for TOC analysis which was performed by Accredited Laboratories of Carteret, New Jersey. Moisture content, pH and grain size was performed by Golder Associates soils laboratory located in Mt. Laurel, New Jersey.

Samples were collected from 8 primary locations and submitted to the laboratory for analysis. In addition to the primary samples, one sampling location was sampled as a Field Duplicate, two Matrix Spike /Matrix Spike Duplicates (MS/MSDs) were collected, and five field rinsate blanks were collected and submitted for analyses. The Sample Identification Points, sampling dates and the corresponding Sample Delivery Groups (SDGs) are summarized in Table D1.

Data validation of the inorganic data collected for the TAL metals was performed in accordance with the USEPA Region II Standard Operating Procedure (SOP) No. HW-2, Revision 11, Evaluation of Metals Data for the Contract Laboratory Program (dated January 1992). Data validation for the organics was performed in accordance with the USEPA Region II SOP No. HW-6, Revision 9, CLP Organics Data Review and Preliminary Review, dated January 1994. These documents are referred to as "functional guidelines" hereafter. Non-TCL/TAL analytical data were validated using the method-specific criteria as well as the criteria specified in the QAPjP dated 1995.

Data qualifiers are defined in Table D2. Where quality control criteria were met, positive results were not qualified and non-detected results were qualified with a "U" flag signifying that the result is below the quantitation limit (organics) or detection limit (inorganics). Where more than one qualifier for a sample result was warranted, the most predominant or general qualifier was applied to the results. For example, a positive result for a volatile organic compound may need to be qualified as undetected (U) due to its presence in the associated blanks; however, the initial or continuing calibration criteria for that compound may not have been met and would warrant qualification as an estimated result (J) or quantitation limit (UJ). In this particular case, the compound would be qualified as having an estimated quantitation limit (UJ). The (R) qualifier, which signifies that the result has been rejected, takes priority over all other qualifiers.

In some cases, there are multiple degrees to which the quality control criteria may not be met. For example, a matrix spike recovery for an inorganic analyte may be slightly greater than the upper limit of the Contract Required Recovery range; the corresponding positive results may be qualified as estimated (J). However, if the matrix spike recovery were greater than 150%, the positive results would be qualified as unusable (R). It should be noted that the discussions contained within Sections 2.0 through 6.0 explain where quality control was deficient. As specified in the functional guidelines, if the non-adherence to quality control criteria are slight, qualification of data may not be warranted. However, if the non-adherence is significant, qualification and possible rejection of the data may be necessary. The narrative discussion specifies where rejection of the data is necessary.

In general, the discussions which follow in Sections 2.0 through 6.0 describe only instances where the quality control criteria specified in the documents named above were not met. Tables D3 through D9 of this document summarize specific samples for which qualification occurred. This report is intended to

address the samples collected in support of the Investigation, except where an overlap has occurred (i.e., QC samples).

Following data validation and qualification, the analytical data and qualifiers for each sample point were summarized. Qualified results are provided in Appendix E of this report in a tabular format.

2.0 TARGET COMPOUND LIST VOLATILE ORGANIC PARAMETERS

A total of eight primary samples were collected from six boreholes. Additionally, one borehole was sampled in duplicate and five rinsate blanks were collected for VOC analyses. The samples were reported in two SDGs which contained the primary samples, field duplicate and rinsate blanks, all of which were analyzed for VOCs using the CLP SOW. The two SDGs, CompuChem 2V and Accutest 24569, were validated in accordance with the functional guidelines.

Data Quality Objectives

Precision: Goals for laboratory and field precision were generally met, except where noted below.

Accuracy: Goals for accuracy were generally met, except where noted below.

Sample Result Verification: All sample results were supported in the raw data.

Detection Limits: The detection limit goals were achieved for all analyses, except where dilutions were required due to matrix problems.

Completeness: The data packages were complete for all requested analyses. Nine (9) samples were validated in these data sets. A total of 299 results for these samples were reported of which 299 were deemed valid. This results in a completeness of 100% for these samples, which meets the Investigation Work Plan objective of 85%.

Major Deficiencies

There were no major deficiencies identified with VOCs.

Minor Deficiencies

Identified below are the minor deficiencies which required qualification of the data. Refer to Table D3 for the specific samples affected by each deficiency.

Volatile SDG (24569)

During the data validation process, the qualitative identification of compounds is evaluated. The evaluations are based on mass spectra, retention time, peak shape and intensity. The laboratory is instructed by the SOW to report a compound as present even if all spectral criteria are not met. For the compound Chloroform in samples GB-4D, FGB-4D and GB-07F; the compound total-1,2-Dichloroethene in sample GB-07F; and the compound Vinyl chloride in sample GBR-02C, the mass spectra indicates that there is presumptive evidence of the presence of the compounds, however, all criteria are not met. Since the compounds are only presumed to be present in the samples, the results for these compounds in the specified samples were qualified with the "N" flag.

3.0 TARGET COMPOUND LIST SEMI-VOLATILE ORGANIC PARAMETERS

A total of eight primary samples were collected from six borehole locations. Additionally, one borehole was sampled in duplicate and five rinsate blanks were collected for SVOCs. The samples, field duplicate and rinsate blanks were reported in two SDGs (SDG CompuChem 2S and Accutest 24569). The SDGs were validated in accordance with the functional guidelines.

Data Quality Objectives

Precision: Goals for laboratory and field precision were generally met, except where noted below.

Accuracy: Goals for accuracy were generally met, except where noted below.

Sample Result Verification: All sample results were supported in the raw data.

Detection Limits: The detection limit goals were achieved for all analyses.

Completeness: The data packages were complete for all requested analyses. Nine (9) samples were validated in these data sets. A total of 576 results for these samples were reported of which 527 were deemed valid. This results in a completeness of 100% for these samples, which meets the Work Plan objective of 85%.

Major Deficiencies

Identified below are the major deficiencies which required qualification of the data. Refer to Tables D4 and D5 for the specific samples affected by each deficiency.

SDG 2S

Samples collected for semi-volatile compound analysis are required to be extracted within seven days of sample collection. Sample B-1B was originally extracted within the required seven-day period. However, the sample was analyzed by GC/MS and determined to have poor surrogate recoveries which required re-extraction. The laboratory re-extracted the sample on day 29 when compared to the sample collection date. As a result, the functional guidelines require samples extracted greater than 28 days from sample collection to be rejected for undetected results (R) and estimated value (J) for positive results.

SDG 24569

During the data validation process, the qualitative identification of compounds is evaluated. The evaluations are based on mass spectra, retention time, peak shape and intensity. The laboratory is instructed by the SOW to report a compound as present even if all spectral criteria are not met. For the compounds Dibenzofuran and Fluorene in sample GB-6D, the mass spectra did not meet any of the criteria specified in the functional guidelines. Since the compounds cannot be presumed to be present in the sample, the results for these compounds in the specified sample were qualified rejected "R".

Minor Deficiencies

Identified below are the minor deficiencies which required qualification of the data. Refer to Tables D4 and D5 for the specific samples affected by each deficiency.

SDG 2S

Laboratory preparation blanks and rinsate blanks are evaluated for target compound contamination. Fluoranthene and Pyrene were found as contaminants in the preparation blank associated with this SDG. The Sample associated with this blank required qualification. For Fluoranthene and Pyrene, an action limit of 5 times the concentration found in the blank was calculated. Since these two compounds were detected below the CRQL in sample B-1B, the result was changed to the CRQL and qualified as undetected (U).

Samples analyzed by GC/MS are quantitatively and qualitatively identified by the mass spectra, retention time and area of the compound. Some compounds have identical mass spectra and similar retention times when compared to other compounds (i.e., isomers). Two compounds, Benzo(b)fluoranthene and Benzo(k)fluoranthene, historically co-elute when the GC column becomes old and short. When two compounds co-elute it is difficult to measure the area under the peak which is needed for quatitation, and separate the two peaks based on mass spectra, needed for qualitative identification. The laboratory is instructed by the SOW to qualify these co-eluting compounds as "JX". The validation specialist replaced the "JX" with the "JN" qualifier signifying estimated reported concentration (J) and tentatively identified compound (N).

The functional guidelines require the percent differences for the response factors between the initial and continuing daily calibration be less than $\pm$ 25%. This criteria was not achieved for the continuing daily calibrations analyzed on September 9, 1997 for the compounds Nitrobenzene, 2-Nitroaniline, 3-

Nitroaniline, 2,4-Dinitrophenol, Fluorene, 4-Nitroaniline, 4,6-Dinitro-2-methylphenol and Carbazole. The samples associated with this calibration required qualification as estimated values (J) for positive results and estimated quantitation limits (UJ) for non-detected results.

SDG 24569

During the data validation process, the qualitative identification of compounds is evaluated. The evaluations are based on mass spectra, retention time, peak shape and intensity. The laboratory is instructed by the SOW to report a compound as present even if all spectral criteria are not met. For the compounds 2,4-Dimethylphenol, 1,2,4-Trichlorobenzene, Acenaphthene, Dibenzofuran, Fluorene and Benzo(a)anthracene in sample GB-4B; and the compounds 1,2,4-Trichlorobenzene, Dibenzofuran and Fluorene in sample GB-4D; the compounds 1,2,4-Trichlorobenzene, Dibenzofuran, Fluorene and Benzo(a)anthracene in sample FGB-4D; the compounds 4-Methylphenol, 1,2,4-Trichlorobenzene, Benzo(a)pyrene, Ideno(1,2,3-c,d)pyrene and Benzo(g,h,I)perylene in sample GB-6D; the compound 1,2,4-Trichlorobenzene in sample GB-02C; the compounds 1,2,4-Trichlorobenzene and Anthracene in sample GB-02B; and the compound Phenathrene in sample GB-07F, the mass spectra indicates that there is presumptive evidence of the presence of the compounds, however, all criteria are not met. Since the compounds are only presumed to be present in the samples, the results for these compounds in the specified samples were qualified with the "N" flag.

4.0 TARGET COMPOUND LIST PESTICIDE/PCBS

A total of eight primary samples were collected from six borehole locations. Additionally, one borehole was sampled in duplicate and five rinsate blanks for Pesticides and Polychlorinated Biphenyls (PCBs). The samples were reported in two SDGs by the laboratories using the SOW. Each SDG was validated in accordance with the functional guidelines and guidance from the USEPA Region II Quality Assurance Chemist.

Data Quality Objectives

Precision: Goals for laboratory and field precision were generally met, except where noted below.

Accuracy: Goals for accuracy were generally met, except where noted below.

Sample Result Verification: All sample results were supported in the raw data. Positive presence of a TCL pesticide/PCB must be confirmed by analysis on a dissimilar chromatographic column. Quantitation is performed for each column and the laboratory reports the lower value. The percent difference between the two results is calculated and reported by the laboratory.

Detection Limits: The detection limit goals were achieved for all analyses.

Completeness: The data packages were complete for all requested analyses. Nine (9) samples were validated in these data sets. A total of 252 results for these samples were reported of which 249 were deemed valid. This results in a completeness of 99% for these samples, which meets the Work Plan objective of 85%.

Major Deficiencies

There were no major deficiencies which required rejection of the data.

Minor Deficiencies

Identified below are the minor deficiencies which required qualification of the data. Refer to Tables D6 and D7 for the specific samples affected by each deficiency.

SDG 2P

Laboratory preparation blanks and rinsate blanks are evaluated for target compound contamination. Aroclor-1254 was found as a contaminant in the preparation blank associated with this SDG. The Sample (B-1B) associated with this blank required qualification. For Aroclor-1254, an action limit of 5 times the concentration found in the blank was calculated. The sample result for Aroclor-1254 was above the CRQL but below the calculated action limit. As a result, the compound was qualified as undetected (U).

The percent differences between the results reported from each GC column were greater than 25% but less than 50% for the compounds Aldrin, Aroclor-1242 and Aroclor-1254 in sample B-1B. In accordance with the functional guidelines, compounds with percent differences greater than 25% but less than 50% were qualified as estimated value (J). Compounds with percent differences less than 25% did not require qualification.

The percent difference between the results reported from each GC column were greater than 90% for the compounds alpha-BHC, Endosulfan sulfate and Endrin ketone in sample B-1B. In accordance with the functional guidelines, compounds with percent differences greater than 90% were qualified as rejected (R).

Compound concentrations that exceed the upper concentration of the initial calibration are required to be diluted by the laboratory and reanalyzed. Two compounds, Dieldrin and Aroclor-1242 exceeded the upper calibration concentration range and were qualified as "E" by the laboratory. The validation specialist qualified these as estimated value (J).

SDGs 2P and 24569

The functional guidelines require the response factors remain stable over the concentration range of the initial calibration (i.e. less than $\pm$ 20% RSD). This criterion was not achieved for the following initial calibrations:

August 21, 1997 for compound:	gamma-BHC;
August 12, 1997 for compound:	Methoxychlor;
September 3, 1997 for compounds:	Methoxychlor and 4,4-DDT; and,
August 16, 1997 for compound:	Methoxychlor.

The samples associated with these initial calibration required qualification as estimated values (J) for positive results and estimated quantitation limits (UJ) for non-detected results.

5.0 METALS PARAMETERS

A total of eight primary samples were collected from six soil boring locations. Additionally, one borehole was sampled in duplicate and five field rinsate blanks were collected. The sample results were reported into two SDGs. Each SDG was validated in accordance with the functional guidelines. The laboratories used an axial "trace" ICP instrument for the analysis of all metals with the exception of mercury. Mercury was analyzed by a cold vapor analyzer. The use of axial "trace" ICP instrument yields lower instrument detection limits for most of the analytes previously analyzed using the conventional ICP instrumentation. Additionally, it allows for the analysis of Arsenic, Selenium, Thallium and Lead by ICP rather that Graphite Furnace Atomic Absorption (GFAA).

Data Quality Objectives

Precision: Goals for laboratory and field precision were generally met, except where noted below.

Accuracy: Goals for accuracy were generally met, except where noted below.

Sample Result Verification: All sample results were supported in the raw data.

Detection Limits: The detection limit goals were achieved for all analyses.

Completeness: The data packages were complete for all requested analyses. Nine (9) samples were validated in these data sets. A total of 207 results were reported of which 207 were deemed valid. This results in a completeness of 100% which meet the Work Plan objective of 85%.

Major Deficiencies

There were no major deficiencies identified with this data

Minor Deficiencies

Identified below are the minor deficiencies which required qualification of the data. Refer to Tables D8 and D9 for the specific samples affected by each deficiency.

SDG 2M

The matrix spike recoveries for Lead and Zinc were greater than the criteria (75% - 125%) specified by the functional guidelines but less than 150%. For the affected sample (B-1B), positive results were qualified as estimated value (J).

The functional guidelines require that a serial dilution be performed on any ICP elements which have concentrations equal to or greater than 10 times the IDL. Serial dilution analysis of the QC sample for this SDG yielded a percent difference between the undiluted and diluted results for Copper and Potassium were greater than 10% but less than 100%. In accordance with the guidelines, positive results greater than 10 times the IDL in the associated samples were qualified as estimated value (J).

SDG 24569

The functional guidelines require that a serial dilution be performed on any ICP elements which have concentrations equal to or greater than 10 times the IDL. Serial dilution analysis of the QC sample for this SDG yielded a percent difference between the undiluted and diluted result for Sodium was greater than 10% but less than 100%. In accordance with the guidelines, positive results greater than 10 times the IDL in the associated samples were qualified as estimated value (J).

SDGs 2M and 24569

The matrix spike recovery for Antimony was lower than the criteria (75% - 125%) specified by the functional guidelines but greater than 30%. For the affected samples, positive results were qualified as estimated values (J), and non-detects were qualified as estimated detection limit (UJ).

6.0 INORGANIC LIST PARAMETERS

A total of eight primary samples were collected from six soil boring locations. Additionally, one borehole was sampled in duplicate and five rinsate blanks for the analysis of the inorganic list parameters. The sample results were presented in multiple reports by the laboratories. Each report was validated in accordance with method-specific criteria and the criteria specified in the QAPjP.

Data Quality Objectives

Precision: Goals for laboratory and field precision were generally met, except where noted below.

Accuracy: Goals for accuracy were generally met, except where noted below.

Sample Result Verification: All sample results were supported in the raw data.

Detection Limits: The detection limit goals were achieved for all analyses

Completeness: The data packages were complete for all requested analyses. Nine (9) samples were validated in this data set. A total of 27 results for these samples were reported of which 27 were deemed valid. The completeness for all analytes is 100% which meets the Work Plan objective of 85% for each parameter.

Major Deficiencies

There were no major deficiencies reported for the Inorganic List Parameters.

Minor Deficiencies

TOC for sample B-1B was reported as >16,000 mg/kg. The laboratory explained that this is the maximum detection for the sample size used. The validation specialist qualified TOC for this sample as an estimated value (J).

7.0 SUMMARY

Validation of the data collected for the FFSI was performed in accordance with USEPA Region II data validation guidelines, as applicable, and the criteria specified by the methods and the QAPjP.

Overall, the data required qualification due to some quality control criteria which were not achieved, but the majority of the data is deemed usable in terms of objectives of the investigation. Although a positive result may be qualified as estimated, the analyte should be considered present. Similarly, a non-detected result which is qualified as an estimated quantitation/detection limit should be considered not present for the purposes of this study, although the limit itself may not be precise. Rejected (unusable) data that are assigned the "R" qualifier should not be used. Rejected data have been included in the summary tables only for the purpose of completeness.

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TABLE D1
SAMPLE POINT IDENTIFICATIONS

SAMPLE POINT I. D.	DATE SAMPLED	SDG NUMBERS VOLATILES	SEMI-VOLATILES	PEST/PCBs	METALS	INORGANIC LIST (1)
SOIL BORING SAMPLES						
B-1B	8/6/97	2V	2S	2P	2M	NA
GB-4B	8/11/97	E24569	E24569	E24569	E24569	E24569
GB-4D	8/11/97	E24569	E24569	E24569	E24569	E24569
GB-6D	8/11/97	E24569	E24569	E24569	E24569	E24569
GB-07F	8/12/97	E24569	E24569	E24569	E24569	E24569
GB-14C	8/15/97	E24569	E24569	E24569	E24569	E24569
GBR02C	8/18/97	E24569	E24569	E24569	E24569	E24569
GBR02B	8/18/97	E24569	E24569	E24569	E24569	E24569
QUALITY CONTROL SAMPLES						
RINSATE BLANKS						
RRF01	8/6/97	1V	1S	1P	1M	NA
RRF03	8/11/97	E24569	E24569	E24569	E24569	E24569
RRF04	8/12/97	E24569	E24569	E24569	E24569	E24569
RRF05	8/15/97	E24569	E24569	E24569	E24569	E24569
RRF06	8/18/97	E24569	E24569	E24569	E24569	E24569
FIELD DUPLICATES						
FGB-4D	8/11/97	E24569	E24569	E24569	E24569	E24569
MATRIX SPIKE/MATRIX SPIKE DUPLICATES						
B-1B	8/6/97	2V	2S	2P	2M	NA
GB-4B	8/11/97	E24569	E24569	E24569	E24569	E24569

NOTES:
(1) Total organic carbon and oil and grease
NA = Not applicable

TABLE D2
Data Qualifiers

Value - The data is acceptable; identification is confirmed.

U - The analyte was tested for but was not detected. The associated numerical value is either the sample quantitation limit (organics) or the sample detection limit (inorganics).

B - The analyte was detected at a concentration which is between the Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL). The data is acceptable.

R - Reject data due to quality control criteria. The data are unusable (analyte may or may not be present in the sample).

N - Tentative identification; consider analyte present.

J - The analyte is present. The associated numerical value is an estimated quantity and may not be accurate or precise.

UJ - The analyte was tested for but not detected. The sample quantitation limit or the sample detection limit is estimated and may be inaccurate or imprecise.

TABLE D3

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TCL Volatiles OLC03.0
SAMPLE DELIVERY GROUP NUMBER: E24569
REVIEWER: Jeffrey R. Hendel

DEFICIENCY	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Presumptive evidence for the presence of the compound	Chloroform	N	GB-4D, FGB-4D, GB-07F
	total-1,2-Dichloroethene	N	GB-07F
	Vinyl chloride	N	GBR02C

TABLE D4

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TCL Semi-Volatiles
SAMPLE DELIVERY GROUP NUMBER: 2S
REVIEWER: Jeffrey R. Hendel

DEFICIENCY	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Presumptive evidence to the presence of the compound	Benzo(b)fluoranthene, Benzo(k)fluoranthene	JN	B-1B
Missed holding times	ALL	J for positive results R for undetected results	B-1B
Blank contamination	Fluoranthene, Pyrene	U	B-1B
% difference between continuing calibration and initial calibration greater than 25%	Nitrobenzene, 2-Nitroaniline, 3-Nitroaniline, 2,4-Dinitrophenol, Fluorene, 4-Nitroaniline, 4,6-Dinitro-2-methylphenol, Carbazole	J for positive results UJ for undetected results	B-1B

TABLE D5

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TCL Semi-Volatiles
SAMPLE DELIVERY GROUP NUMBER: E24569
REVIEWER: Jeffrey R. Hendel

DEFICIENCY	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Presumptive evidence to the presence of the compound	2,4-Dimethylphenol, 1,2,4-Trichlorobenzene, Acenaphthene, Dibenzofuran, Fluorene, Benzo(a)anthracene	N	GB-4B
	1,2,4-Trichlorobenzene, Dibenzofuran, Fluorene	N	GB-4D
	1,2,4-Trichlorobenzene, Dibenzofuran, Fluorene, Benzo(a)anthracene	N	FGB-4D
	Phenanthrene	N	GB-07F
	1,2,4-Trichlorobenzene	N	GB02C
	1,2,4-Trichlorobenzene, Anthracene	N	GB02B
	4-Methylphenol, 1,2,4-Trichlorobenzene, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Benzo(g,h,I)perylene	N	GB-6D
	Dibenzofuran, Fluorene	R	GB-6D

TABLE D6

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TCL Pesticide/PCBs
SAMPLE DELIVERY GROUP NUMBER: 2P
REVIEWER: Jeffrey R. Hendel

DEFICIENCY	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Blank contamination	Aroclor-1254	U	B-1B
%RSD over the initial calibration greater than 20%	gamma-BHC	J for positive results UJ for undetected results	B-1B
%D between concentrations reported on each GC column greater than 25% but less than 50%	Aldrin, Aroclor-1242, Aroclor-1254	J	B-1B
%D between concentrations reported on each GC column greater than 90%	alpha-BHC, Endosulfan sulfate, Endrin ketone	R	B-1B
Compounds exceeded the upper limit of the initial calibration	Dieldrin, Aroclor-1242	J	B-1B

TABLE D7

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TCL Pesticide/PCBs
SAMPLE DELIVERY GROUP NUMBER: E24569
REVIEWER: Jeffrey R. Hendel

DEFICIENCY	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
%RSD over the initial calibration greater than 20%	Methoxychlor	J for positive results	ALL
	4,4-DDT	J for positive results	GB-14C, GBR02C, GBR02B

TABLE D8

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TAL Metals - ILMO4.0
SAMPLE DELIVERY GROUP NUMBER: 2M
REVIEWER: *Jeffrey R. Hendel*

DEFICIENCY	ANALYTE(S)	QUALIFIER	SAMPLES AFFECTED
Matrix spike recovery greater than 125% but less than 150%	Lead, Zinc	J for positive results	B-1B
Matrix spike recovery less than 75% but greater than 30%	Antimony	J for positive results UJ for non-detected results	B-1B
Percent difference greater than 10% for Serial Dilution	Copper, Potassium	J for positive results greater than ten times the IDL	B-1B

TABLE D9

DATE: November 3, 1997 **PROJECT NO.: 943-6222**
PROJECT NAME: 216 Paterson Plank Road Site
ANALYSIS: TAL Metals - ILMO4.0
SAMPLE DELIVERY GROUP NUMBER: E24569
REVIEWER: Jeffrey R. Hendel

DEFICIENCY	ANALYTE(S)	QUALIFIER	SAMPLES AFFECTED
Matrix spike recovery less than 75% but greater than 10%	Antimony	J for positive results UJ for non-detected results	ALL
Percent difference greater than 10% for Serial Dilution	Sodium	J for positive results greater than ten times the IDL	ALL

APPENDIX E

Analytical Data

November 1997

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Volatile Organics

943-6222

Matrix: Soil

		Sample Point B-1B Date Sampled:8/6/97 Dilution Factor: 1 Percent Solid: NA %			Sample Point 0GB-4B Date Sampled: 8/11/97 Dilution Factor: 40 Percent Solid: NA %			Sample Point 0GB-4D Date Sampled: 8/11/97 Dilution Factor: 80 Percent Solid: NA %			Sample Point FGB-4D Date Sampled: 8/11/97 Dilution Factor: 80 Percent Solid: NA %			Sample Point 0GB-6D Date Sampled: 8/11/97 Dilution Factor: 80 Percent Solid: NA %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
1200	Chloromethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Bromomethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Vinyl Chloride	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Chloroethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Methylene Chloride	30000	30000	U	100000	52000	J	200000	100000	J	200000	100000	J	200000	200000	J
1200	Acetone	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Carbon Disulfide	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	1,1-Dichloroethene	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	1,1-Dichloroethane	30000	3400	J	100000	51000	J	200000	210000		200000	160000	J	200000	120000	J
1200	cis-1,2-Dichloroethene	30000	4200	J	100000	NA		200000	NA		200000	NA		200000	NA	
1200	trans-1,2-Dichloroethene	30000	30000	U	100000	NA		200000	NA		200000	NA		200000	NA	
1200	Total 1,2-Dichloroethene	30000	NA		100000	30000	J	200000	24000	J	200000	200000	U	200000	49000	J
1200	Chloroform	30000	30000	U	100000	54000	J	200000	30000	JN	200000	31000	JN	200000	240000	
1200	1,2-Dichloroethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	2-Butanone	30000	30000	U	100000	100000	U	200000	260000		200000	200000	U	200000	340000	
1200	1,1,1-Trichloroethane	30000	30000	U	100000	430000		200000	150000	J	200000	150000	J	200000	1200000	
1200	Carbon Tetrachloride	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Bromodichloromethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	1,2-Dichloropropane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	cis-1,3-Dichloropropene	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Trichloroethene	30000	520000		100000	6000000		200000	6700000		200000	5500000		200000	7300000	
1200	Dibromochloromethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	1,1,2-Trichloroethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Benzene	30000	30000	U	100000	34000	J	200000	73000	J	200000	66000	J	200000	57000	J
1200	trans-1,3-Dichloropropene	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Bromoform	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	4-Methyl-2-Pentanone	30000	19000	J	100000	190000		200000	460000		200000	420000		200000	440000	
1200	2-Hexanone	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Tetrachloroethene	30000	330000		100000	5200000		200000	6200000		200000	4600000		200000	6000000	
1200	1,1,2,2-Tetrachloroethane	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Toluene	30000	470000		100000	4700000		200000	5900000		200000	4500000		200000	5700000	
1200	Chlorobenzene	30000	8400	J	100000	380000		200000	1200000		200000	1000000		200000	260000	
1200	Ethylbenzene	30000	110000		100000	940000		200000	1100000		200000	970000		200000	1100000	
1200	Styrene	30000	30000	U	100000	100000	U	200000	200000	U	200000	200000	U	200000	200000	U
1200	Total Xylenes	30000	720000		100000	5300000		200000	5700000		200000	5200000		200000	6100000	

Notes:

All units are µg/kg.

Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.

The Qual column indicates the qualifier applied to the result following data validation.

Results are reported on wet weight basis.

101312

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Volatile Organics

Matrix: Soil

		Sample Point 0BG-07F			Sample Point OGB-14C			Sample Point OGBR02B			Sample Point OGBR02C			Sample Point		
		Date Sampled: 8/12/97			Date Sampled: 8/15/97			Date Sampled: 8/18/97			Date Sampled: 8/18/97			Date Sampled:		
		Dilution Factor: 100			Dilution Factor: 1			Dilution Factor: 80			Dilution Factor: 80			Dilution Factor:		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
1200	Chloromethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Bromomethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Vinyl Chloride	250000	250000	U	20000	44000		200000	200000	U	200000	58000	J			
1200	Chloroethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Methylene Chloride	250000	450000		20000	20000	U	200000	38000	J	200000	38000	J			
1200	Acetone	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Carbon Disulfide	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	1,1-Dichloroethene	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	1,1-Dichloroethane	250000	250000	U	20000	16000	J	200000	200000	U	200000	200000	U			
1200	Total 1,2-Dichloroethene	250000	28000	JN	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Chloroform	250000	340000	N	20000	20000	U	200000	200000	U	200000	200000	U			
1200	1,2-Dichloroethane	250000	340000		20000	20000	U	200000	200000	U	200000	200000	U			
1200	2-Butanone	250000	370000		20000	57000		200000	200000	U	200000	200000	U			
1200	1,1,1-Trichloroethane	250000	2700000		20000	20000	U	200000	200000	U	200000	200000	U			
1200	Carbon Tetrachloride	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Bromodichloromethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	1,2-Dichloropropane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	cis-1,3-Dichloropropene	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Trichloroethene	250000	8900000		20000	99000		200000	2400000		200000	1600000				
1200	Dibromochloromethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	1,1,2-Trichloroethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Benzene	250000	62000	J	20000	28000		200000	28000	J	200000	38000	J			
1200	trans-1,3-Dichloropropene	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Bromoform	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	4-Methyl-2-Pentanone	250000	470000		20000	42000		200000	200000	U	200000	97000	J			
1200	2-Hexanone	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Tetrachloroethene	250000	8900000		20000	370000		200000	1200000		200000	880000				
1200	1,1,2,2-Tetrachloroethane	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Toluene	250000	6700000		20000	410000		200000	2200000		200000	1800000				
1200	Chlorobenzene	250000	260000		20000	49000		200000	86000	J	200000	74000	J			
1200	Ethylbenzene	250000	1100000		20000	100000		200000	420000		200000	350000				
1200	Styrene	250000	250000	U	20000	20000	U	200000	200000	U	200000	200000	U			
1200	Total Xylenes	250000	5700000		200000	550000		200000	2600000		200000	2100000				

Notes:

All units are µg/kg.

Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.

The Qual column indicates the qualifier applied to the result following data validation.

Results are reported on wet weight basis.

1011313

November 1997

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Semivolatile Organics

943-6222

Matrix: Soil

		Sample Point			Sample Point			Sample Point			Sample Point			Sample Point		
		0B-1B			0GB-4B			0GB-4D			FGB-4D			0GB-6D		
		Date Sampled:8/6/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97		
		Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
330	1,3-Dichlorobenzene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	1,4-Dichlorobenzene	330	330	J	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	1,2-Dichlorobenzene	330	600	J	330	34000		330	28000		330	19000		330	57000	
330	1,2,4-Trichlorobenzene	330	81	J	330	3300	JN	330	3000	JN	330	2000	JN	330	5700	JN
330	Phenol	330	1700	J	330	48000		330	64000		330	70000		330	140000	
330	bis(2-Chloroethyl)ether	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2-Chlorophenol	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2-Methylphenol	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2,2'-Oxybis(1-Chloropropane)	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	4-Methylphenol	330	460	J	330	18000		330	15000		330	16000		330	24000	N
330	N-Nitroso-di-n-propylamine	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Hexachloroethane	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Nitrobenzene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Isophorone	330	1400	J	330	10000	U	330	14000		330	8700	J	330	33000	
330	2-Nitrophenol	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2,4-Dimethylphenol	330	330	R	330	9900	JN	330	10000	U	330	9000	J	330	19000	
330	bis(2-Chloroethoxy)Methane	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2,4-Dichlorophenol	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Naphthalene	330	1100	J	330	75000		330	52000		330	30000		330	73000	
330	4-Chloroaniline	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Hexachlorobutadiene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	4-Chloro-3-Methylphenol	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2-Methylnaphthalene	330	510	J	330	25000		330	18000		330	12000		330	28000	
330	Hexachlorocyclopentadiene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2,4,6-Trichlorophenol	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
800	2,4,5-Trichlorophenol	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
330	2-Chloronaphthalene	330	330	R	330	31000		330	22000		330	16000		330	97000	
800	2-Nitroaniline	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
330	Dimethyl Phthalate	330	330	R	330	2400	J	330	10000	U	330	10000	U	330	10000	U
330	Acenaphthylene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	2,6-Dinitrotoluene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
800	3-Nitroaniline	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
330	Acenaphthene	330	330	R	330	890	JN	330	10000	U	330	10000	U	330	10000	U
800	2,4-Dinitrophenol	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
800	4-Nitrophenol	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
330	Dibenzofuran	330	160	J	330	2600	JN	330	3200	JN	330	2000	JN	330	3900	R
330	2,4-Dinitrotoluene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U

Notes:

All units are µg/kg.

Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.

The Qual column indicates the qualifier applied to the result following data validation.

NA indicates Not Analyzed.

Results are reported on wet weight basis.

101314

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Semivolatile Organics

Matrix: Soil

		Sample Point 0B-1B			Sample Point 0GB-4B			Sample Point 0GB-4D			Sample Point FGB-4D			Sample Point 0GB-6D		
		Date Sampled: 8/6/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97		
		Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
330	Diethylphthalate	330	330	R	330	12000		330	1200	J	330	1500	J	330	4200	J
330	4-Chlorophenyl-phenylether	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Fluorene	330	77	J	330	1200	JN	330	1600	JN	330	1200	JN	330	2000	R
800	4-Nitroaniline	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
800	4,6-Dinitro-2-methylphenol	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
330	N-Nitrosodiphenylamine	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	4-Bromophenyl-phenylether	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Hexachlorobenzene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
800	Pentachlorophenol	800	830	R	800	25000	U	800	25000	U	800	25000	U	800	25000	U
330	Phenanthrene	330	240	J	330	4100	J	330	4200	J	330	2800	J	330	6300	J
330	Anthracene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Carbazole	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Di-n-butylphthalate	330	370	J	330	52000		330	8700	J	330	9100	J	330	42000	
330	Fluoranthene	330	160	R	330	2500	J	330	2000	J	330	1300	J	330	3700	J
330	Pyrene	330	78	R	330	1600	J	330	1800	J	330	980	J	330	3600	J
330	Butylbenzylphthalate	330	43	J	330	20000		330	2200	J	330	2900	J	330	19000	
330	3,3'-Dichlorobenzidine	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Benzo(a)Anthracene	330	330	R	330	900	JN	330	590	J	330	470	JN	330	1700	JN
330	Chrysene	330	330	R	330	1100	J	330	1100	J	330	810	J	330	2000	J
330	bis(2-Ethylhexyl)Phthalate	330	7300	J	330	600000		330	190000		330	110000		330	610000	
330	Di-n-Octyl Phthalate	330	500	J	330	23000		330	4500	J	330	4700	J	330	37000	
330	Benzo(b)Fluoranthene	330	69	JN	330	820	J	330	700	J	330	10000	U	330	10000	U
330	Benzo(k)Fluoranthene	330	68	JN	330	620	J	330	490	J	330	10000	U	330	10000	U
330	Benzo(a)Pyrene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	550	JN
330	Indeno(1,2,3-cd)Pyrene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	790	JN
330	Dibenz(a,h)Anthracene	330	330	R	330	10000	U	330	10000	U	330	10000	U	330	10000	U
330	Benzo(g,h,i)Perylene	330	330	R	330	600	J	330	10000	U	330	10000	U	330	1200	JN

101315

Notes:
All units are µg/kg.
Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.
The Qual column indicates the qualifier applied to the result following data validation.
NA indicates Not Analyzed.
Results are reported on wet weight basis.

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Semivolatile Organics

Matrix: Soil

		Sample Point			Sample Point			Sample Point			Sample Point			Sample Point		
		0BG-07F			OGB-14C			OGBR02B			OGBR02C					
		Date Sampled: 8/12/97			Date Sampled: 8/15/97			Date Sampled: 8/18/97			Date Sampled: 8/18/97			Date Sampled:		
		Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor:		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
330	1,3-Dichlorobenzene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	1,4-Dichlorobenzene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	1,2-Dichlorobenzene	330	130000		330	3400	J	330	14000		330	8400	J			
330	1,2,4-Trichlorobenzene	330	100000	U	330	10000	U	330	2300	JN	330	950	JN			
330	Phenol	330	95000	J	330	25000		330	56000		330	72000				
330	bis(2-Chloroethyl)ether	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2-Chlorophenol	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2-Methylphenol	330	100000	U	330	10000	U	330	3500	J	330	3300	J			
330	2,2'-Oxybis(1-Chloropropane)	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	4-Methylphenol	330	20000	J	330	5600	J	330	13000		330	15000				
330	N-Nitroso-di-n-propylamine	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Hexachloroethane	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Nitrobenzene	330	380000		330	10000	U	330	10000	U	330	10000	U			
330	Isophorone	330	20000	J	330	1100	J	330	50000		330	13000				
330	2-Nitrophenol	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2,4-Dimethylphenol	330	10000	J	330	4700	J	330	12000		330	11000				
330	bis(2-Chloroethoxy)Methane	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2,4-Dichlorophenol	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Naphthalene	330	57000	J	330	3000	J	330	51000		330	18000				
330	4-Chloroaniline	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Hexachlorobutadiene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	4-Chloro-3-Methylphenol	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2-Methylnaphthalene	330	21000	J	330	1100	J	330	21000		330	6500	J			
330	Hexachlorocyclopentadiene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2,4,6-Trichlorophenol	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
800	2,4,5-Trichlorophenol	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
330	2-Chloronaphthalene	330	35000	J	330	23000		330	55000		330	40000				
800	2-Nitroaniline	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
330	Dimethyl Phthalate	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Acenaphthylene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	2,6-Dinitrotoluene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
800	3-Nitroaniline	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
330	Acenaphthene	330	100000	U	330	10000	U	330	1600	J	330	10000	U			
800	2,4-Dinitrophenol	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
800	4-Nitrophenol	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
330	Dibenzofuran	330	100000	U	330	10000	U	330	5400	J	330	2100	J			
330	2,4-Dinitrotoluene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			

Notes:

All units are µg/kg.

Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.

The Qual column indicates the qualifier applied to the result following data validation.

NA indicates Not Analyzed.

Results are reported on wet weight basis.

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Semivolatile Organics

Matrix: Soil

		Sample Point 0BG-07F			Sample Point OGB-14C			Sample Point OGBR02B			Sample Point OGBR02C			Sample Point		
		Date Sampled:8/12/97			Date Sampled: 8/15/97			Date Sampled: 8/18/97			Date Sampled: 8/18/97			Date Sampled:		
		Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor:		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
330	Diethylphthalate	330	13000	J	330	10000	U	330	10000	U	330	10000	U			
330	4-Chlorophenyl-phenylether	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Fluorene	330	100000	U	330	10000	U	330	3200	J	330	890	J			
800	4-Nitroaniline	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
800	4,6-Dinitro-2-methylphenol	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
330	N-Nitrosodiphenylamine	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	4-Bromophenyl-phenylether	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Hexachlorobenzene	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
800	Pentachlorophenol	800	250000	U	800	25000	U	800	25000	U	800	25000	U			
330	Phenanthrene	330	5500	JN	330	10000	U	330	12000		330	4300	J			
330	Anthracene	330	100000	U	330	10000	U	330	1800	JN	330	10000	U			
330	Carbazole	330	100000	U	330	10000	U	330	920	J	330	10000	U			
330	Di-n-butylphthalate	330	56000	J	330	10000	U	330	10000	U	330	10000	U			
330	Fluoranthene	330	100000	U	330	10000	U	330	6900	J	330	1800	J			
330	Pyrene	330	100000	U	330	10000	U	330	4600	J	330	1100	J			
330	Butylbenzylphthalate	330	37000	J	330	10000	U	330	10000	U	330	10000	U			
330	3,3'-Dichlorobenzidine	330	100000	U	330	10000	U	330	10000	U	330	10000	U			
330	Benzo(a)Anthracene	330	100000	U	330	10000	U	330	2400	J	330	550	J			
330	Chrysene	330	100000	U	330	10000	U	330	3000	J	330	720	J			
330	bis(2-Ethylhexyl)Phthalate	330	430000		330	1300	J	330	37000		330	8500	J			
330	Di-n-Octyl Phthalate	330	17000	J	330	10000	U	330	10000	U	330	10000	U			
330	Benzo(b)Fluoranthene	330	100000	U	330	10000	U	330	2300	J	330	10000	U			
330	Benzo(k)Fluoranthene	330	100000	U	330	10000	U	330	1600	J	330	10000	U			
330	Benzo(a)Pyrene	330	100000	U	330	10000	U	330	1200	J	330	10000	U			
330	Indeno(1,2,3-cd)Pyrene	330	100000	U	330	10000	U	330	1300	J	330	10000	U			
330	Dibenz(a,h)Anthracene	330	100000	U	330	10000	U	330	1100	J	330	10000	U			
330	Benzo(g,h,i)Perylene	330	100000	U	330	10000	U	330	1400	J	330	10000	U			

101317

Notes:
All units are µg/kg.
Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.
The Qual column indicates the qualifier applied to the result following data validation.
NA indicates Not Analyzed.
Results are reported on wet weight basis.

November 1997

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Pesticides / PCBs

943-6222

Matrix: Soil

		Sample Point 0B-1B			Sample Point 0GB-4B			Sample Point 0GB-4D			Sample Point FGB-4D			Sample Point 0GB-6D		
		Date Sampled:8/6/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97			Date Sampled: 8/11/97		
		Dilution Factor: 10			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
1.7	alpha-BHC	17	2.2	R	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	beta-BHC	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	delta-BHC	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	gamma-BHC (Lindane)	17	17	J	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	Heptachlor	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	Aldrin	17	1600	J	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	Heptachlor Epoxide	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	Endosulfan I	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
3.3	Dieldrin	33	860	J	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
3.3	4,4'-DDE	33	33	U	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
3.3	Endrin	33	33	U	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
3.3	Endosulfan II	33	33	U	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
3.3	4,4'-DDD	33	33	U	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
3.3	Endosulfan Sulfate	33	16	R	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
3.3	4,4'-DDT	33	33	U	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
17	Methoxychlor	170	170	U	17	500	U	17	500	U	17	500	U	17	500	U
3.3	Endrin Ketone	33	42	R	3.3	100	U	3.3	1900	J	3.3	8400		3.3	100	U
3.3	Endrin Aldehyde	33	33	U	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U
1.7	alpha-Chlordane	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
1.7	gamma-Chlordane	17	17	U	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U
170	Toxaphene	1700	1700	U	170	5000	U	170	5000	U	170	5000	U	170	5000	U
33	Aroclor-1016	330	330	U	33	1000	U	33	1000	U	33	1000	U	33	1000	U
33	Aroclor-1221	330	670	U	33	2000	U	33	2000	U	33	2000	U	33	2000	U
67	Aroclor-1232	670	330	U	67	1000	U	67	1000	U	67	1000	U	67	1000	U
33	Aroclor-1242	330	49000	J	33	770000		33	800000		33	680000		33	1400000	
33	Aroclor-1248	330	330	U	33	1000	U	33	1000	U	33	1000	U	33	1000	U
33	Aroclor-1254	330	6300	U	33	1000	U	33	1000	U	33	1000	U	33	1000	U
33	Aroclor-1260	330	330	U	33	1000	U	33	1000	U	33	1000	U	33	1000	U

Notes:

All units are µg/kg.

Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.

The Qual column indicates the qualifier applied to the result following data validation.

NA indicates Not Analyzed.

Results are reported on wet weight basis.

101318

SUMMARY OF CLP ORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Pesticides / PCBs

Matrix: Soil

		Sample Point			Sample Point			Sample Point			Sample Point			Sample Point		
		0BG-07F			OGB-14C			OGBR02B			OGBR02C					
		Date Sampled: 8/12/97			Date Sampled: 8/15/97			Date Sampled: 8/18/97			Date Sampled: 8/18/97			Date Sampled:		
		Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor: 1			Dilution Factor:		
		Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: NA %			Percent Solid: %		
CRQL	Parameter	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual	SQL	Result	Qual
1.7	alpha-BHC	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	beta-BHC	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	delta-BHC	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	gamma-BHC (Lindane)	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	Heptachlor	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	Aldrin	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	Heptachlor Epoxide	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	Endosulfan I	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
3.3	Dieldrin	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	4,4'-DDE	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	Endrin	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	Endosulfan II	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	4,4'-DDD	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	Endosulfan Sulfate	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	4,4'-DDT	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
17	Methoxychlor	17	500	U	17	500	U	17	500	U	17	500	U			
3.3	Endrin Ketone	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
3.3	Endrin Aldehyde	3.3	100	U	3.3	100	U	3.3	100	U	3.3	100	U			
1.7	alpha-Chlordane	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
1.7	gamma-Chlordane	1.7	50	U	1.7	50	U	1.7	50	U	1.7	50	U			
170	Toxaphene	170	5000	U	170	5000	U	170	5000	U	170	5000	U			
33	Aroclor-1016	33	1000	U	33	1000	U	33	1000	U	33	1000	U			
33	Aroclor-1221	33	2000	U	33	2000	U	33	2000	U	33	2000	U			
67	Aroclor-1232	67	1000	U	67	1000	U	67	1000	U	67	1000	U			
33	Aroclor-1242	33	1300000		33	82000		33	390000		33	300000				
33	Aroclor-1248	33	1000	U	33	1000	U	33	1000	U	33	1000	U			
33	Aroclor-1254	33	1000	U	33	1000	U	33	1000	U	33	1000	U			
33	Aroclor-1260	33	1000	U	33	1000	U	33	1000	U	33	1000	U			

Notes:

All units are µg/kg.

Sample Quantitation Limit (SQL) is the CRQL multiplied by the dilution factor.

The Qual column indicates the qualifier applied to the result following data validation.

NA indicates Not Analyzed.

Results are reported on wet weight basis.

101319

November 1997

SUMMARY OF INORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
TAL Metals

943-6222

Matrix: Soil

	Sample Point 0B-1B				Sample Point 0GB-4B				Sample Point 0GB-4D				Sample Point FGB-4D			
	Date Sampled: 8/6/97				Date Sampled: 8/11/97				Date Sampled: 8/11/97				Date Sampled: 8/11/97			
	Dilution Factor: NA				Dilution Factor: NA				Dilution Factor: NA				Dilution Factor: NA			
	Percent Solid: NA %				Percent Solid: NA %				Percent Solid: NA %				Percent Solid: NA %			
Parameter	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual
Aluminum	200	4.5	5140		200	61	4270		200	61	3890		200	61	3800	
Antimony	60	1.7	1.4	J	60	2.7	10.1	J	60	2.7	8.1	J	60	2.7	7.4	J
Arsenic	10	2.7	11.2		10	4.5	12.7		10	4.5	9.3		10	4.5	7.6	
Barium	200	0.1	349		200	10.4	590		200	10.4	637		200	10.4	653	
Beryllium	5	0.1	0.41	B	5	0.1	1.8		5	0.1	1.3		5	0.1	1.3	
Cadmium	5	0.3	147		5	0.5	43.4		5	0.5	52.2		5	0.5	39.2	
Calcium	5000	5.6	19200		5000	37.3	23900		5000	37.3	37400		5000	37.3	36700	
Chromium	10	0.8	58		10	1.8	209		10	1.8	265		10	1.8	255	
Cobalt	50	0.6	2.9	B	50	1.7	5.6	B	50	1.7	4.7	B	50	1.7	4.2	B
Copper	25	0.5	5760	J	25	2.7	6350		25	2.7	4180		25	2.7	4250	
Iron	100	11.7	9830		100	35.3	13600		100	35.3	11400		100	35.3	10000	
Lead	3	1.1	245	J	3	1.4	947		3	1.4	999		3	1.4	985	
Magnesium	5000	3.4	2780		5000	19.6	2260		5000	19.6	3280		5000	19.6	3240	
Manganese	15	0.2	124		15	0.5	189		15	0.5	181		15	0.5	168	
Mercury	0.2	0.2	2.2		0.2	0.2	4.7		0.2	0.2	4.4		0.2	0.2	3.7	
Nickel	40	0.9	10.5		40	2	16.7		40	2	19.9		40	2	18.9	
Potassium	5000	20.4	395	J	5000	98.6	507	B	5000	98.6	537	B	5000	98.6	529	B
Selenium	5	2.8	3.8		5	3.7	1.7		5	3.7	2.2		5	3.7	2	
Silver	10	0.4	0.53	B	10	2.0	1.4	B	10	2.0	6.9		10	2.0	7.2	
Sodium	5000	222	6550		5000	826	10100		5000	826	28000		5000	826	28200	
Thallium	10	4.7	.94	U	10	4	0.8	U	10	4	0.8	U	10	4	0.8	U
Vanadium	50	0.6	12.3		50	1.6	19.2		50	1.6	17.5		50	1.6	16.7	
Zinc	20	0.3	242	J	20	1.9	1840		20	1.9	2260		20	1.9	2500	

Notes:

All units are mg/kg.
CRDL indicates Contract Required Detection Limit.
IDL is the Instrument Detection Limit.
The Qual column indicates the qualifier applied to the result following data validation.
NA indicates Not Applicable.
NS indicates Not Analyzed.
Results are reported on wet weight basis.

101320

SUMMARY OF INORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
TAL Metals

Matrix: Soil

	Sample Point				Sample Point				Sample Point				Sample Point			
	0GB-6D				0BG-07F				OGB-14C				OGBR02B			
	Date Sampled: 8/11/97				Date Sampled: 8/12/97				Date Sampled: 8/15/97				Date Sampled: 8/18/97			
	Dilution Factor: NA				Dilution Factor: NA				Dilution Factor: NA				Dilution Factor: NA			
	Percent Solid: NA %				Percent Solid: NA %				Percent Solid: NA %				Percent Solid: NA %			
Parameter	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual
Aluminum	200	61	4830		200	61	2660		200	61	3990		200	61	5040	
Antimony	60	2.7	6	J	60	2.7	12.8	J	60	2.7	1.2	J	60	2.7	1.3	J
Arsenic	10	4.5	10.8		10	4.5	9.3		10	4.5	5.1		10	4.5	4	
Barium	200	10.4	619		200	10.4	702		200	10.4	68.3		200	10.4	91.6	
Beryllium	5	0.1	1		5	0.1	0.72	B	5	0.1	2.5		5	0.1	0.56	B
Cadmium	5	0.5	34.1		5	0.5	47.4		5	0.5	6.7		5	0.5	6.4	
Calcium	5000	37.3	25600		5000	37.3	19800		5000	37.3	21900		5000	37.3	18800	
Chromium	10	1.8	260		10	1.8	233		10	1.8	71.5		10	1.8	91.9	
Cobalt	50	1.7	4.4	B	50	1.7	4.5	B	50	1.7	1.4	B	50	1.7	2.7	B
Copper	25	2.7	2970		25	2.7	1830		25	2.7	10200		25	2.7	975	
Iron	100	35.3	12000		100	35.3	22700		100	35.3	3370		100	35.3	6140	
Lead	3	1.4	813		3	1.4	1320		3	1.4	152		3	1.4	228	
Magnesium	5000	19.6	2550		5000	19.6	1420		5000	19.6	5260		5000	19.6	1340	
Manganese	15	0.5	198		15	0.5	153		15	0.5	81.1		15	0.5	80.7	
Mercury	0.2	0.2	6.2		0.2	0.2	3.1		0.2	0.2	0.79		0.2	0.2	7.5	
Nickel	40	2	14.8		40	2	12.4		40	2	7.6	B	40	2	9.9	
Potassium	5000	98.6	496	B	5000	98.6	300	B	5000	98.6	443	B	5000	98.6	625	B
Selenium	5	3.7	1.1		5	3.7	2		5	3.7	0.74	U	5	3.7	0.74	U
Silver	10	2.0	1.4	B	10	2.0	1.8	B	10	2.0	0.6	B	10	2.0	2.8	
Sodium	5000	826	13900		5000	826	8540		5000	826	35500		5000	826	35800	
Thallium	10	4	0.8	U	10	4	0.8	U	10	4	0.8	U	10	4	0.8	U
Vanadium	50	1.6	18.9		50	1.6	19.3		50	1.6	6.7	B	50	1.6	12.9	
Zinc	20	1.9	2980		20	1.9	10000		20	1.9	218		20	1.9	268	

Notes:

All units are mg/kg.

CRDL indicates Contract Required Detection Limit.

IDL is the Instrument Detection Limit.

The Qual column indicates the qualifier applied to the result following data validation.

NA indicates Not Applicable.

NS indicates Not Analyzed.

Results are reported on wet weight basis.

101321

November 1997

SUMMARY OF INORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
TAL Metals

943-6222

Matrix: Soil

	Sample Point				Sample Point				Sample Point				Sample Point			
	OGBR02C															
	Date Sampled: 8/18/97				Date Sampled:				Date Sampled:				Date Sampled:			
	Dilution Factor: NA				Dilution Factor:				Dilution Factor:				Dilution Factor:			
	Percent Solid: NA %				Percent Solid: %				Percent Solid: %				Percent Solid: %			
Parameter	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual	CRDL	IDL	Result	Qual
Aluminum	200	61	3090													
Antimony	60	2.7	2.7	J												
Arsenic	10	4.5	6.1													
Barium	200	10.4	119													
Beryllium	5	0.1	0.86	B												
Cadmium	5	0.5	10.2													
Calcium	5000	37.3	37300													
Chromium	10	1.8	203													
Cobalt	50	1.7	1.9	B												
Copper	25	2.7	2590													
Iron	100	35.3	4920													
Lead	3	1.4	479													
Magnesium	5000	19.6	5280													
Manganese	15	0.5	123													
Mercury	0.2	0.2	2.9													
Nickel	40	2	12.8													
Potassium	5000	98.6	480	B												
Selenium	5	3.7	1.1													
Silver	10	2.0	4.9													
Sodium	5000	826	44500													
Thallium	10	4	0.8	U												
Vanadium	50	1.6	12.3													
Zinc	20	1.9	365													

Notes:

All units are mg/kg.
CRDL indicates Contract Required Detection Limit.
IDL is the Instrument Detection Limit.
The Qual column indicates the qualifier applied to the result following data validation.
NA indicates Not Applicable.
NS indicates Not Analyzed.
Results are reported on wet weight basis.

101322

November 1997

SUMMARY OF INORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Indicator List Parameters

943-6222

Matrix: Soil

	Sample Point 0GB-4B Date Sampled: 8/11/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point 0GB-4D Date Sampled: 8/11/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point FGB-4D Date Sampled: 8/11/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point 0BG-07F Date Sampled: 8/12/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point 0GB-6D Date Sampled: 8/11/97 Dilution Factor: 1 Percent Solid: NA %	
Parameter	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Total Organic Carbon	53500		61500		52600		30600		62900	
Oil And Grease, Gravimetric	50900		44800		41300		106000		57200	
Oil And Grease, Infrared	83700		21900		17800		47800		38400	

Notes:

All units are mg/kg.

The Qual column indicates the qualifier applied to the result following data validation.

NA indicates Not Analyzed.

Results are reported on wet weight basis.

101323

November 1997

SUMMARY OF INORGANICS ANALYSES
216 Paterson Plank Road Site
Sample Results
Indicator List Parameters

943-6222

Matrix: Soil

	Sample Point *OGB-14C* Date Sampled:8/15/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point *OGBR02B* Date Sampled: 8/18/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point *OGBR02C* Date Sampled: 8/18/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point *B-1B* Date Sampled: 8/6/97 Dilution Factor: 1 Percent Solid: NA %		Sample Point Date Sampled: Dilution Factor: Percent Solid: %	
Parameter	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Total Organic Carbon	30800		31700		36600		16000	J		
Oil And Grease, Gravimetric	76900		19000		42000		NA			
Oil And Grease, Infrared	3040		27000		28300		18700			

Notes:
All units are mg/kg.
The Qual column indicates the qualifier applied to the result following data validation.
NA indicates Not Analyzed.
Results are reported on wet weight basis.

101324

APPENDIX F

Geotechnical Data

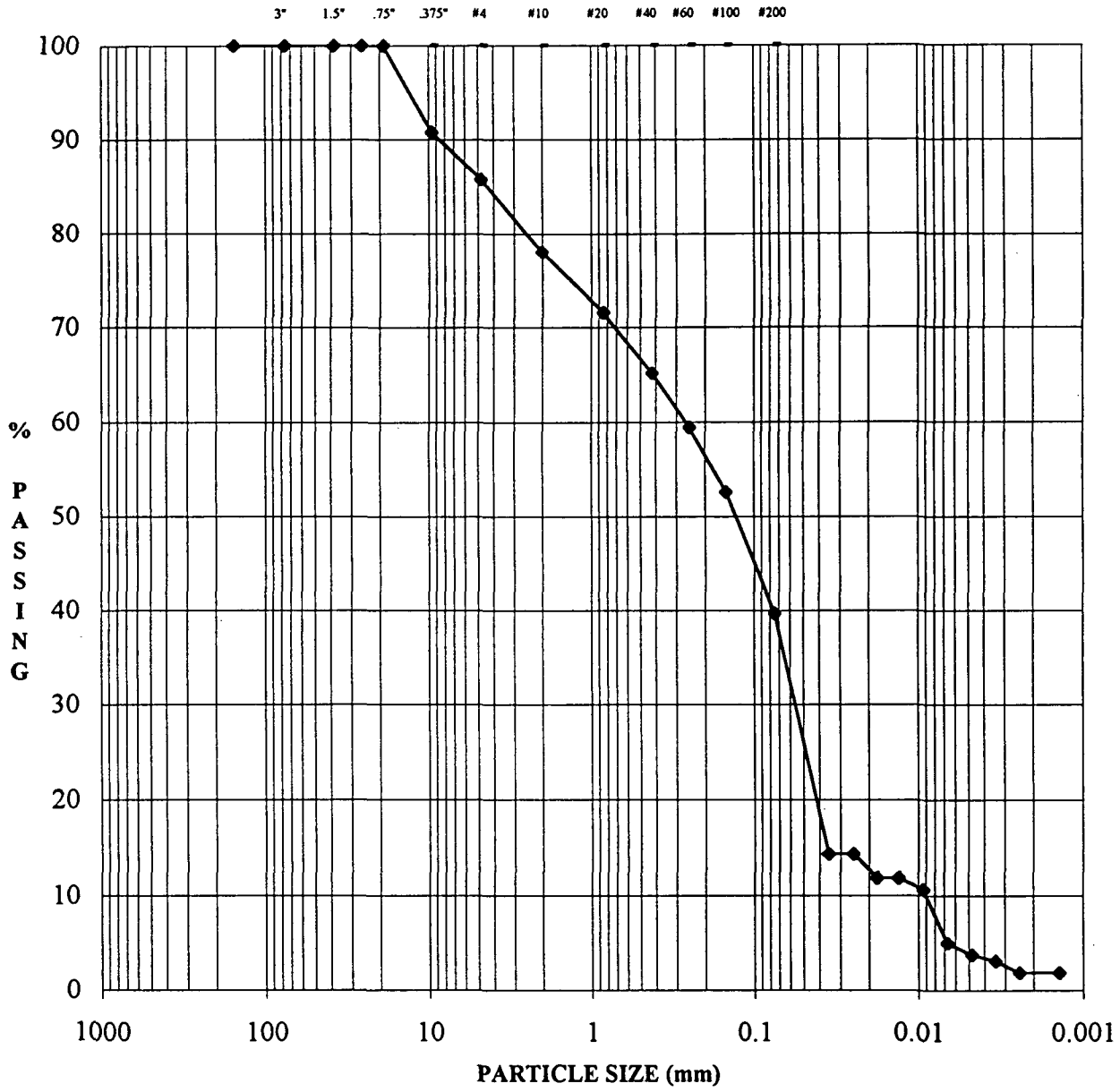
Particle Size Analysis, pH, and Moisture Content

NOTE

During performance of the hydrometer testing portion of the particle size analyses according to ASTM D422, a chemical reaction occurred between the sludge sample specimens and the dispersing agent used in the test (sodium hexametaphosphate), which produced temporary foaming when the specimens were introduced into the hydrometer. This temporary foaming interfered with accurate determination of the percent particles passing the 0.05 to 0.07 mm size. The particle size distributions presented in this appendix have been approximated in this range based on the slopes of the distribution curves for particle sizes outside of this range.

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	
COBBLE	GRAVEL		SAND			Silt or Clay Size FINES

SAMPLE #:	B1-B	Mc:	32.09%	DATE:	9/3/97
		Gs:	2.65 (ASSUMED)	TECH:	NC/RDD
		LL:	-	REVIEW:	RMW
WET COLOR:	Very dark brown	PL:	-		
DESCRIPTION:	m-f Sand and Fines, some f gravel	PI:	-		
		pH:	8.19		

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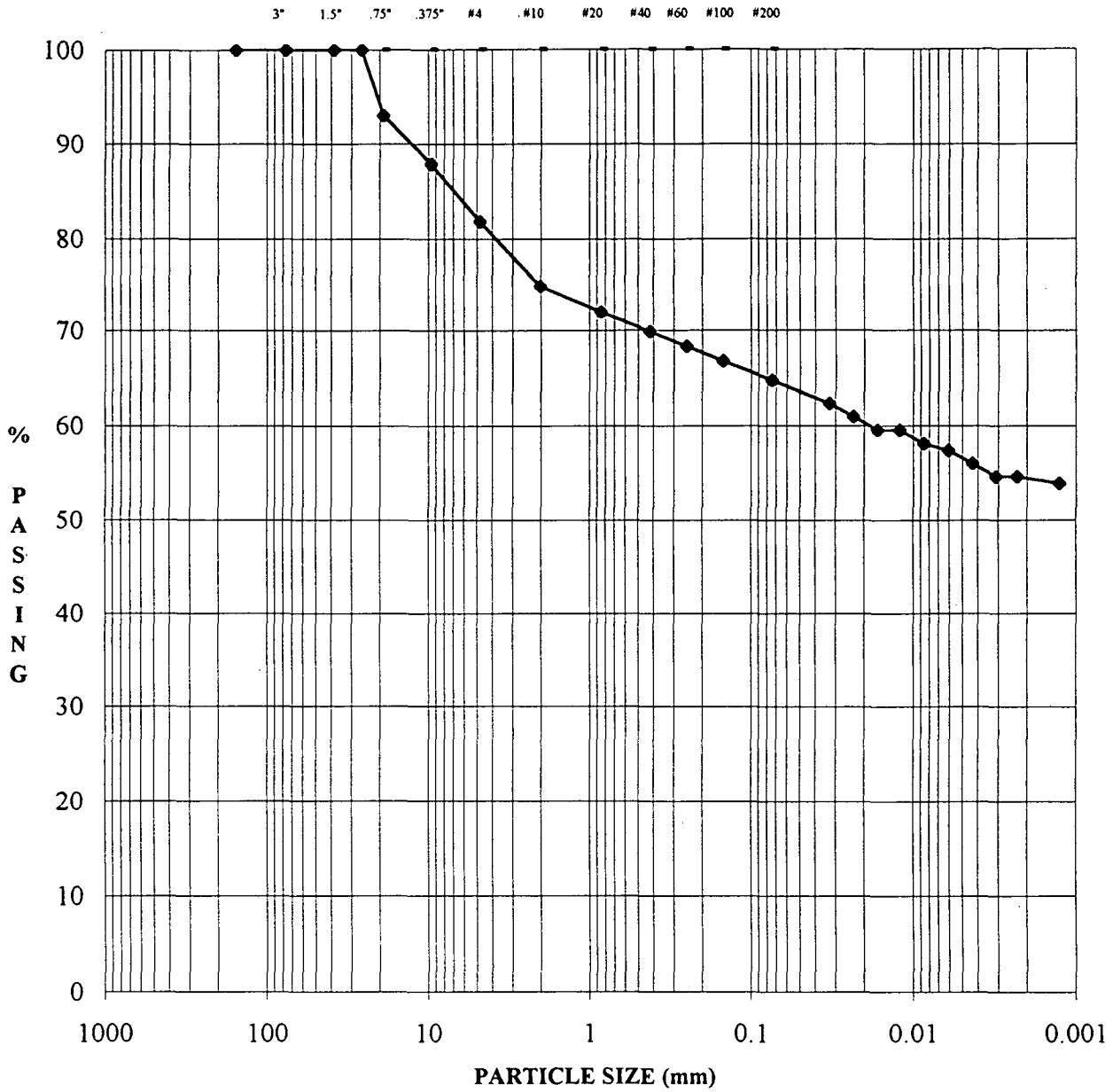
US STANDARD SIEVE OPENING SIZES



COBBLE	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	OGB-02C	Mc:	106.76%		DATE:	9/3/97
		Gs:	2.65	(ASSUMED)	TECH:	NC/RDD
		LL:	-		REVIEW:	RMW
WET COLOR:	Very dark brown	PL:	-			
DESCRIPTION:	Fines, some f gravel, some sand	PI :	-			
		pH:	10.62			

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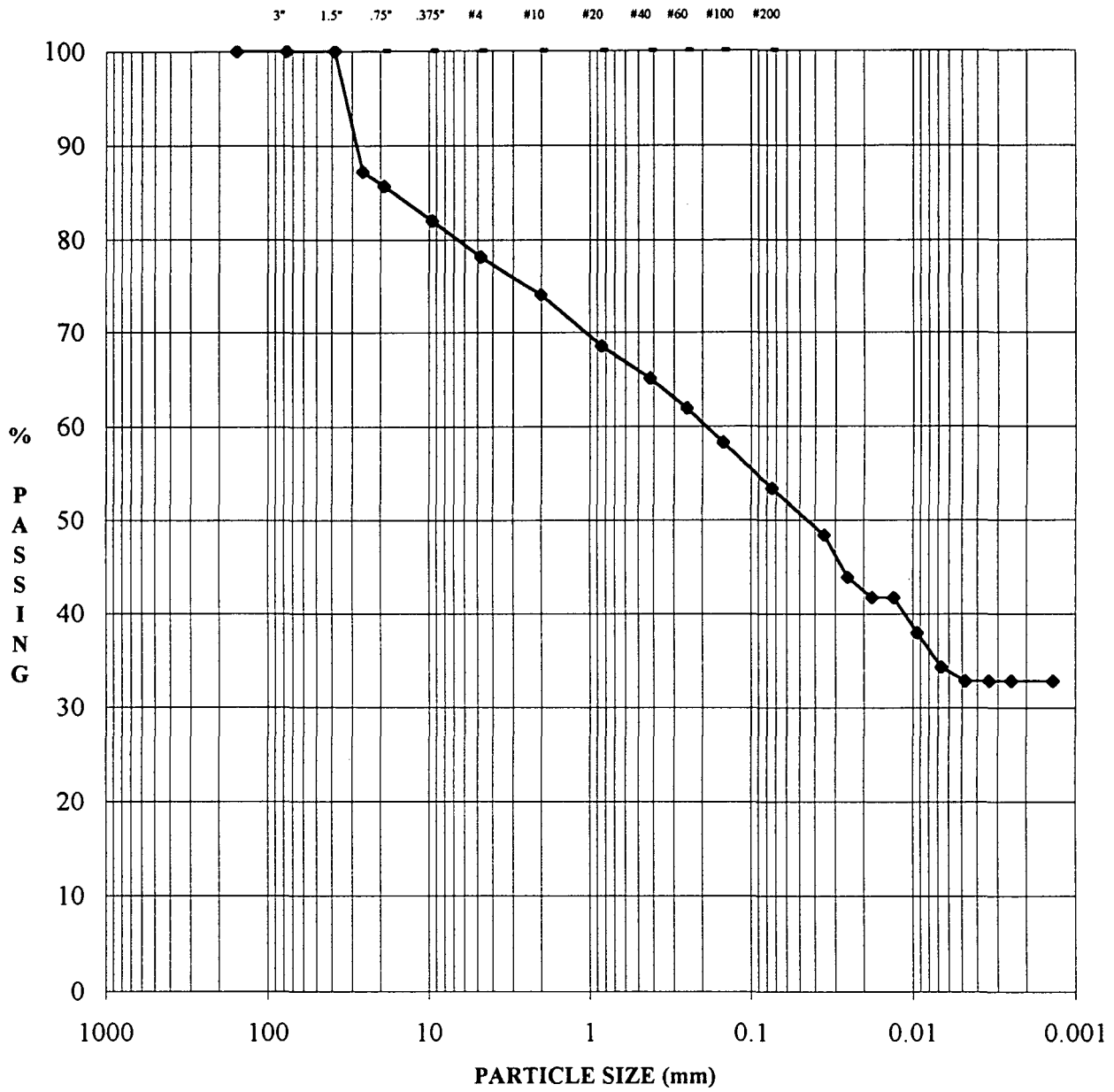
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	OGB-04B	Mc:	63.74%		DATE:	9/3/97
		Gs:	2.65	(ASSUMED)	TECH:	NC/RDD
		LL:	-		REVIEW:	RMW
WET COLOR:	Very dark brown	PL:	-			
DESCRIPTION:	Fines, some f gravel, some f sand	PI :	-			
		pH:	7.11			

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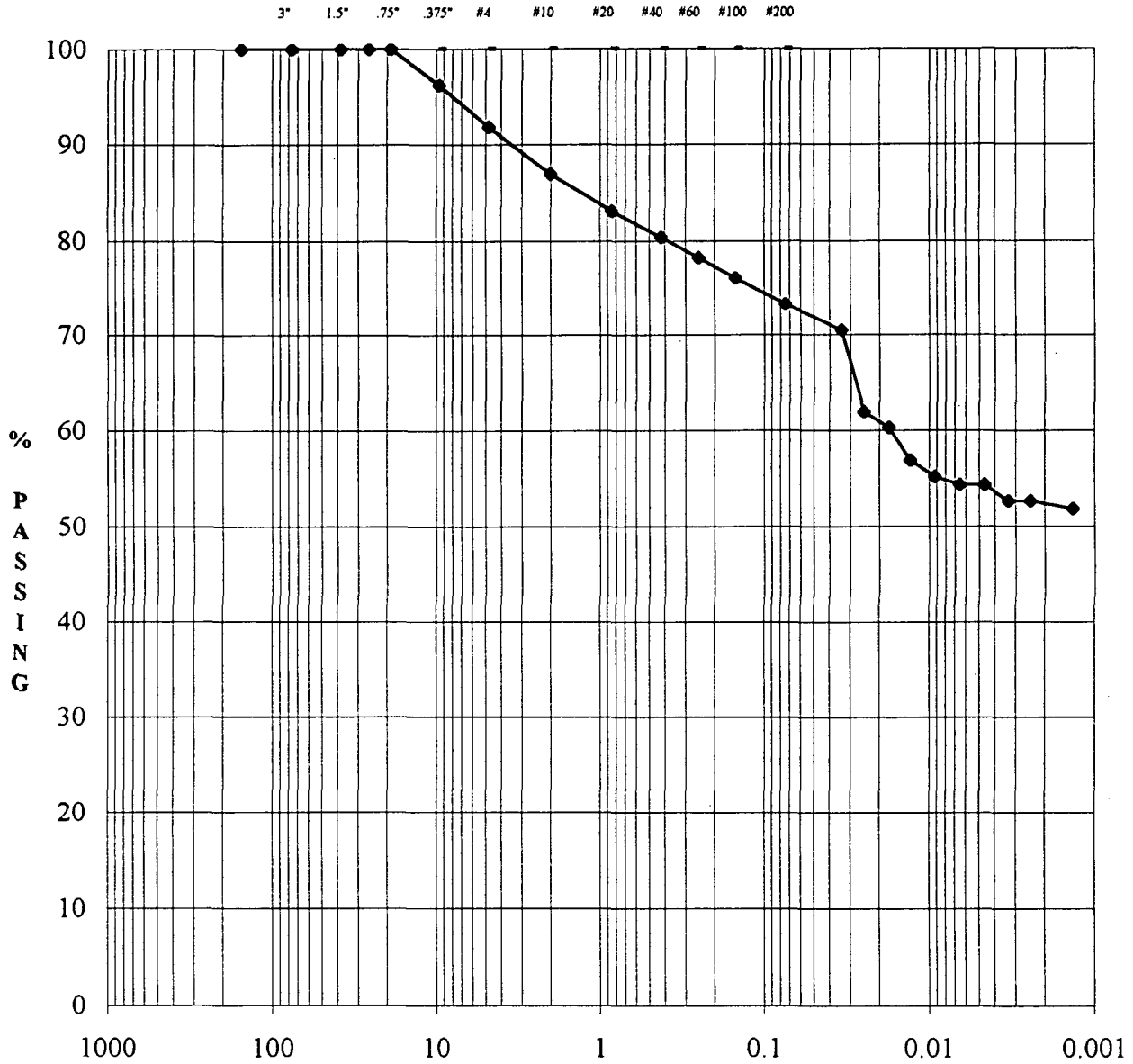
PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	OGB-04D	Mc:	86.38%		DATE:	9/3/97
		Gs:	2.65	(ASSUMED)	TECH:	NC/RDD
		LL:	-		REVIEW:	RMW
WET COLOR:	Very dark brown	PL:	-			
DESCRIPTION:	Fines, some sand, little gravel	PI :	-			
		pH:	9.69			

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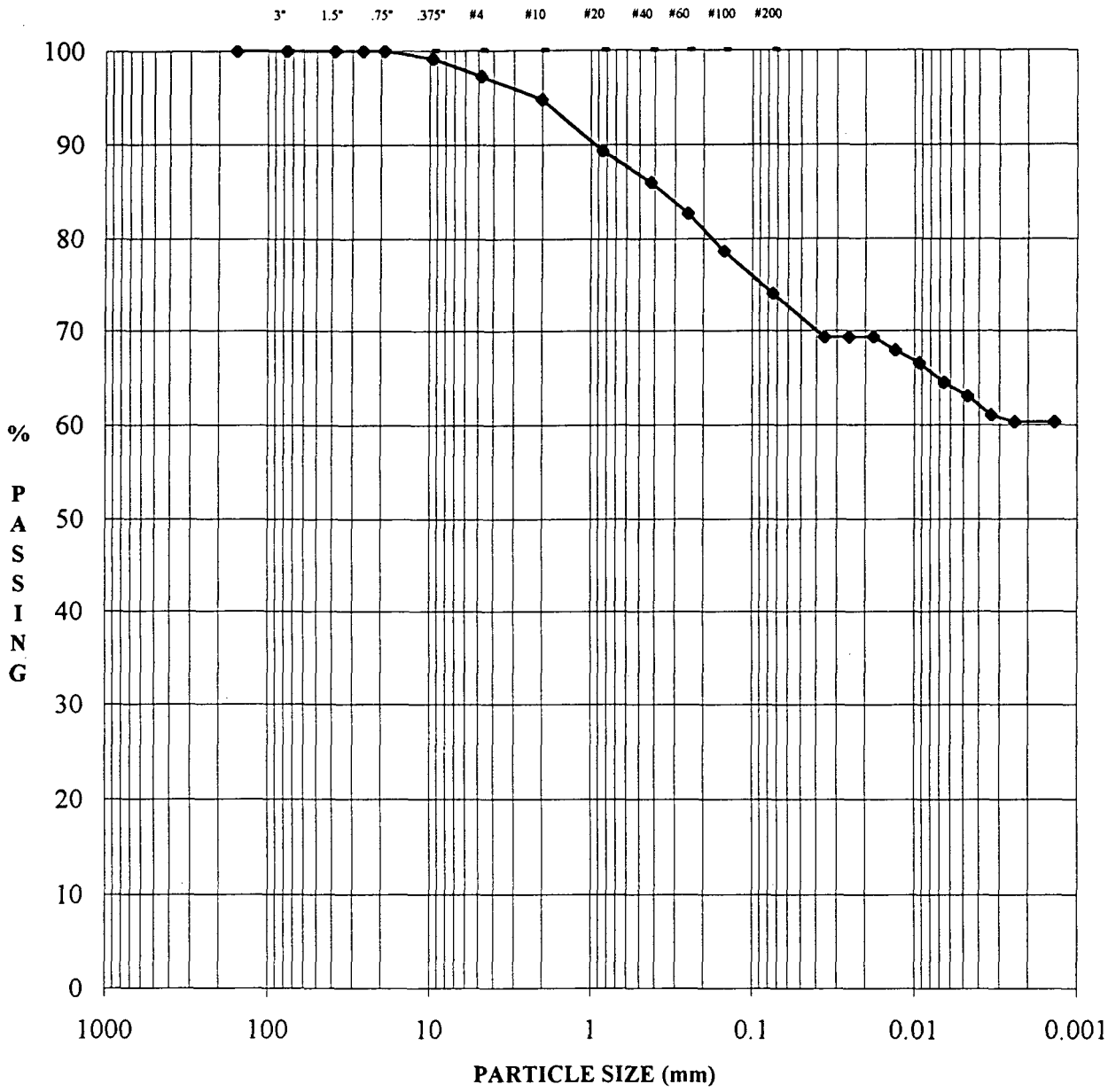
PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	OGB-06D	Mc:	76.87%	DATE:	9/3/97
		Gs:	2.65 (ASSUMED)	TECH:	NC/RDD
		ATTERBERG LIMITS		REVIEW:	RMW
WET COLOR:	Very dark brown	LL:	-		
DESCRIPTION:	Fines, some f sand, trace gravel	PL:	-		
		PI :	-		

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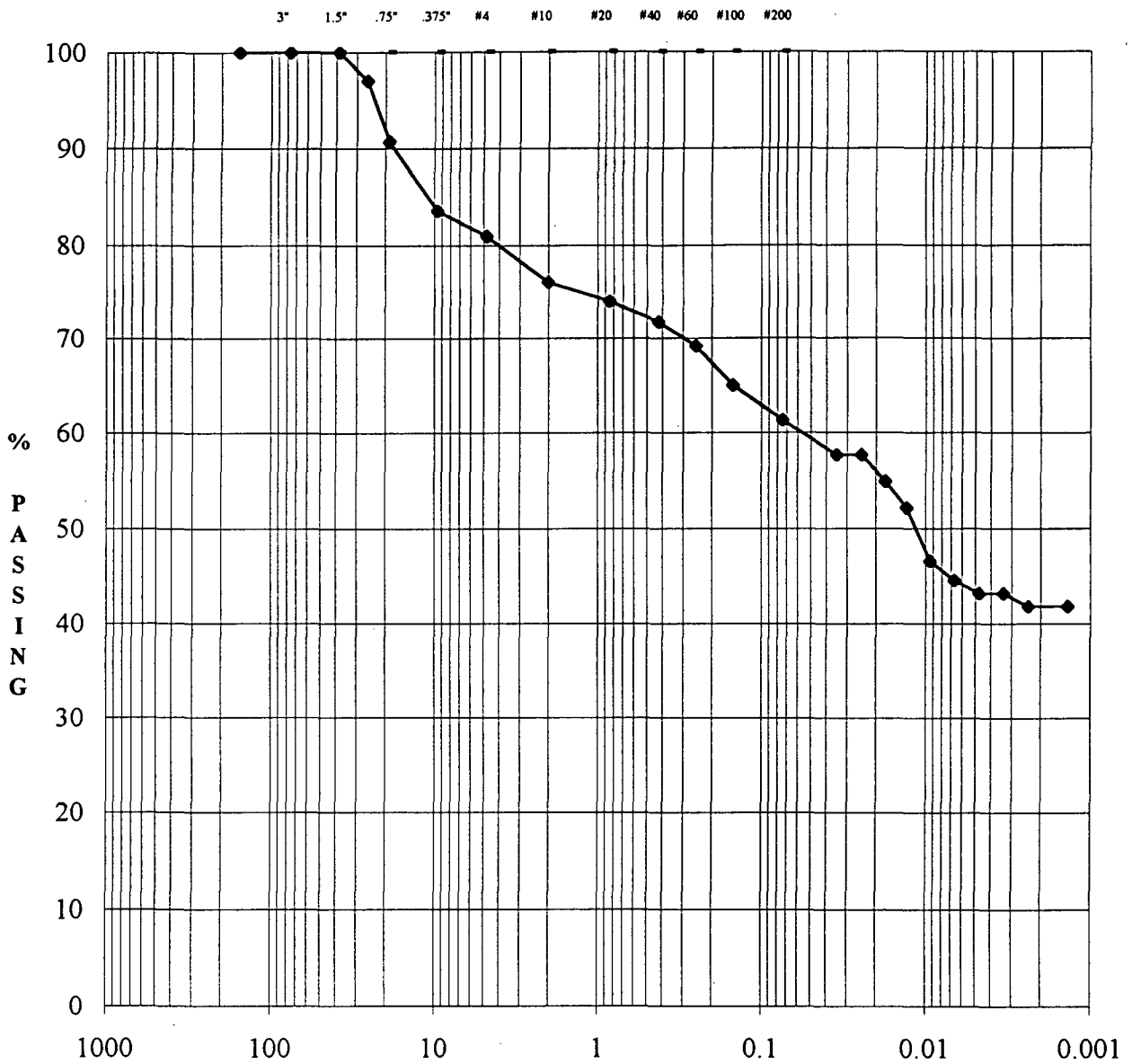
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	OGB-07F	Mc:	55.08%	DATE:	9/3/97
		Gs:	2.65 (ASSUMED)	TECH:	NC/RDD
		ATTERBERG LIMITS		REVIEW:	RMW
WET COLOR:	Very dark brown	LL:	-		
DESCRIPTION:	Fines, some f sand, some gravel	PL:	-		
		PI :	-		

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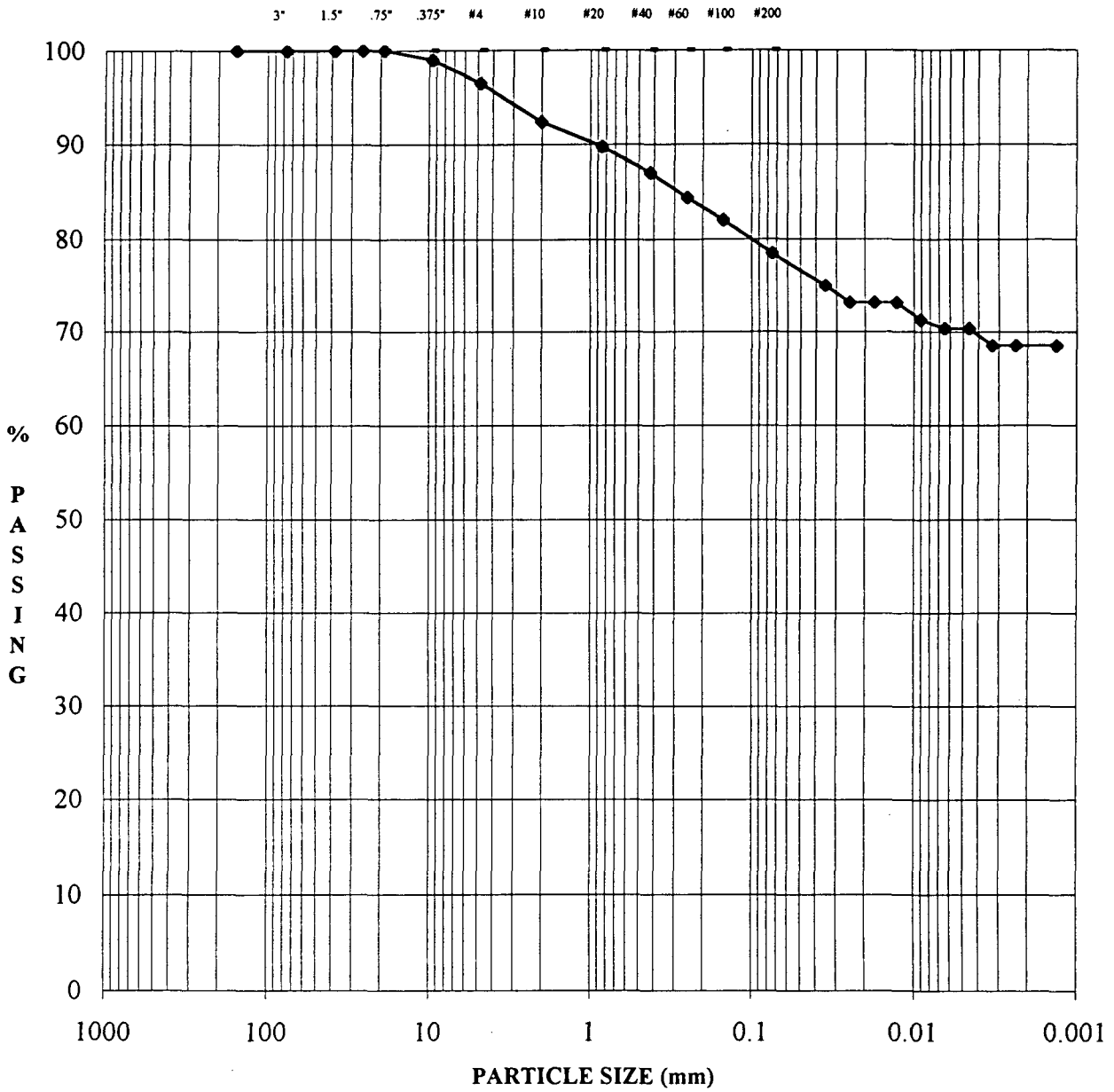
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	OGB-14C	Mc:	120.01%	DATE:	9/3/97
		Gs:	2.65 (ASSUMED)	TECH:	NC/RDD
		ATTERBERG LIMITS		REVIEW:	RMW
WET COLOR:	Dark brown	LL:	-		
DESCRIPTION:	Fines, some sand, some gravel	PL:	-		
		PI:	-		

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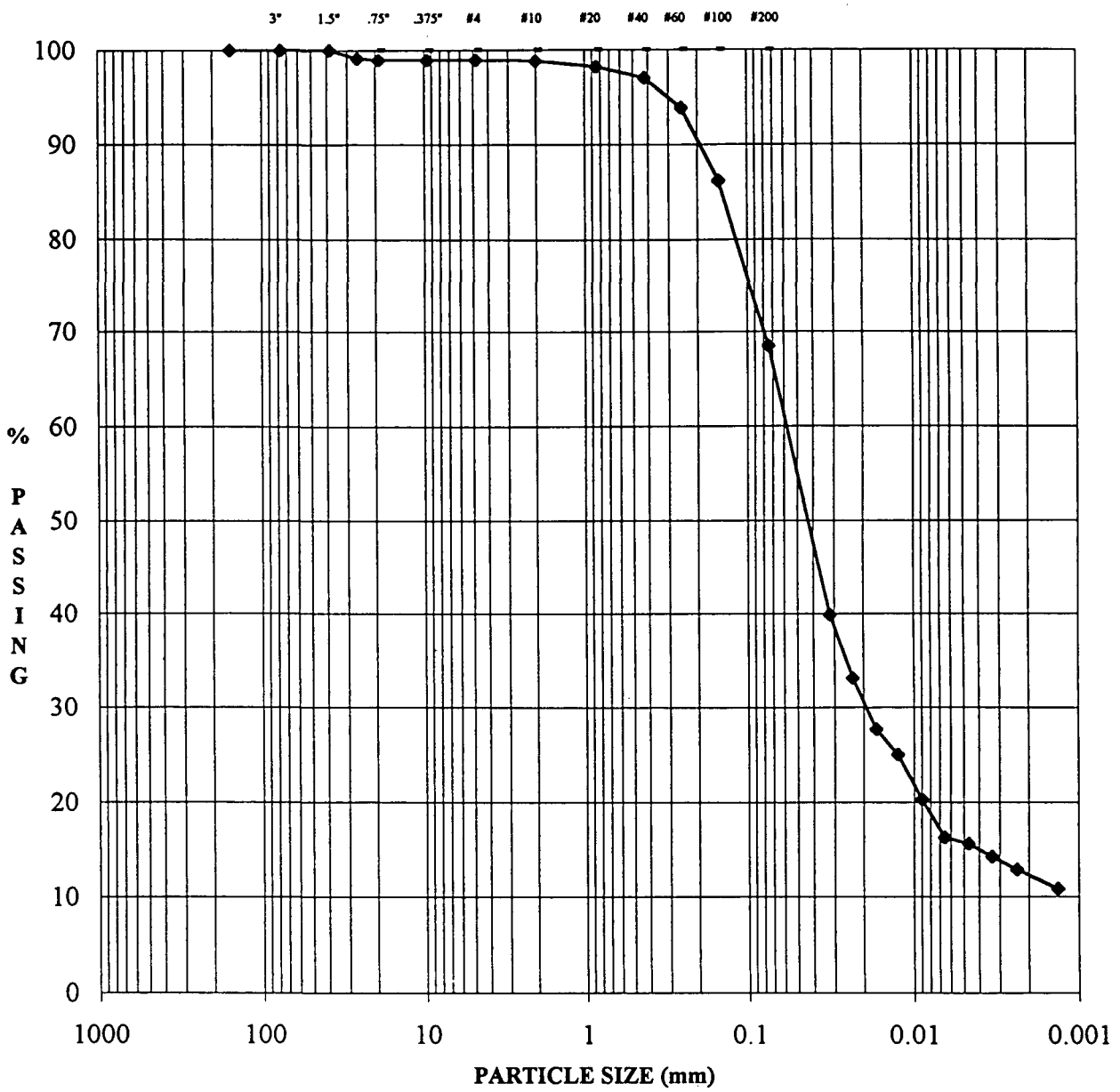
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	ST-03	Mc:	23.16%	DATE:	9/17/97
		Gs:	2.65 (ASSUMED)	TECH:	NC/RDD
	PEAT (8.5'-11')	LL:	-	REVIEW:	RMW
WET COLOR:	Black	PL:	-		
DESCRIPTION:	Fines, some f sand, trace gravel	PI :	-		

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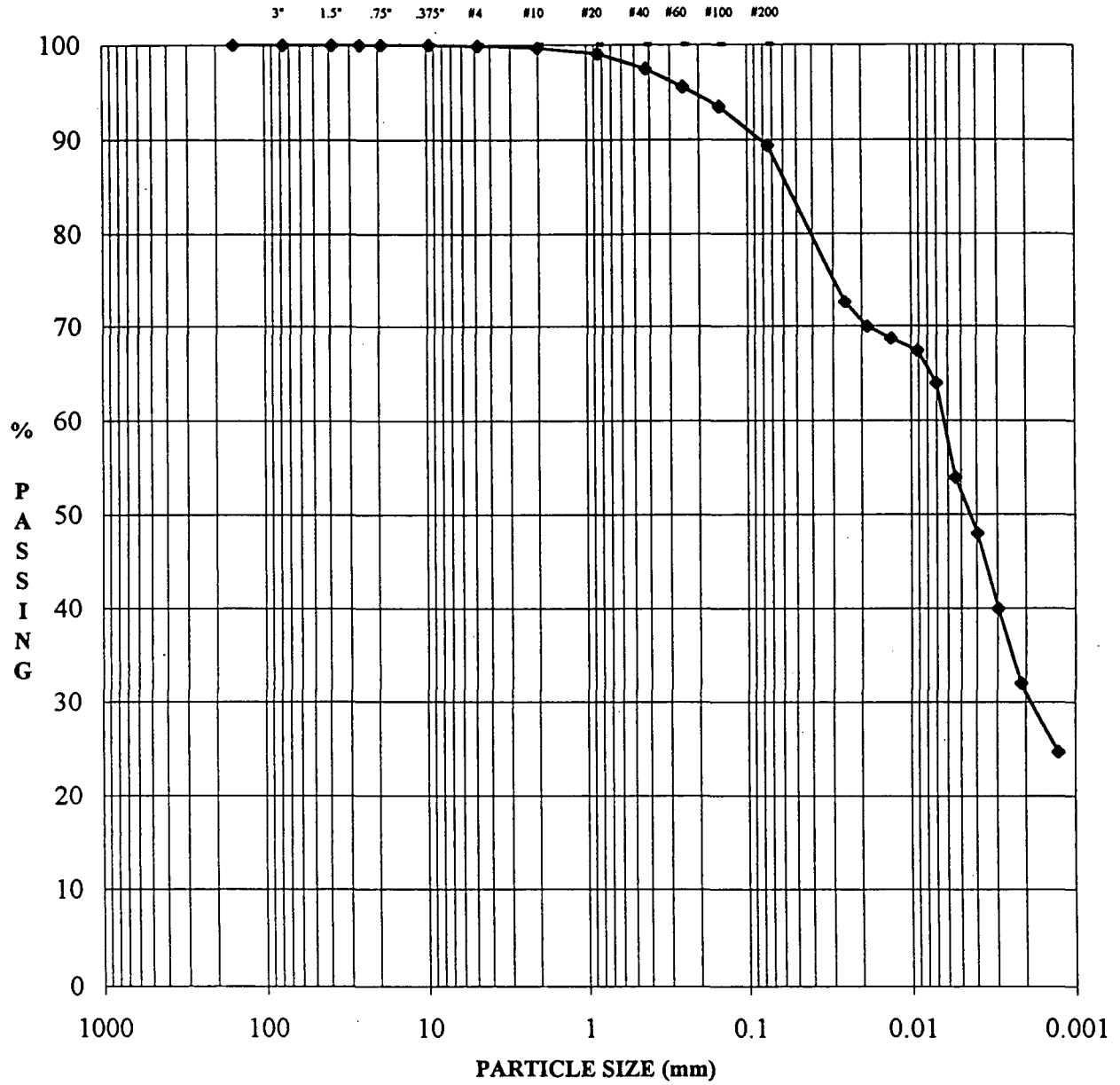
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	ST-04	Mc:	27.76%		DATE:	9/17/97
		Gs:	2.65	(ASSUMED)	TECH:	NC/RDD
	CLAY (12.5'-15')	LL:	38		REVIEW:	RMW
WET COLOR:	Light olive brown	PL:	22			
DESCRIPTION:	Silty Clay, little sand, trace gravel (CL)	PI :	16			

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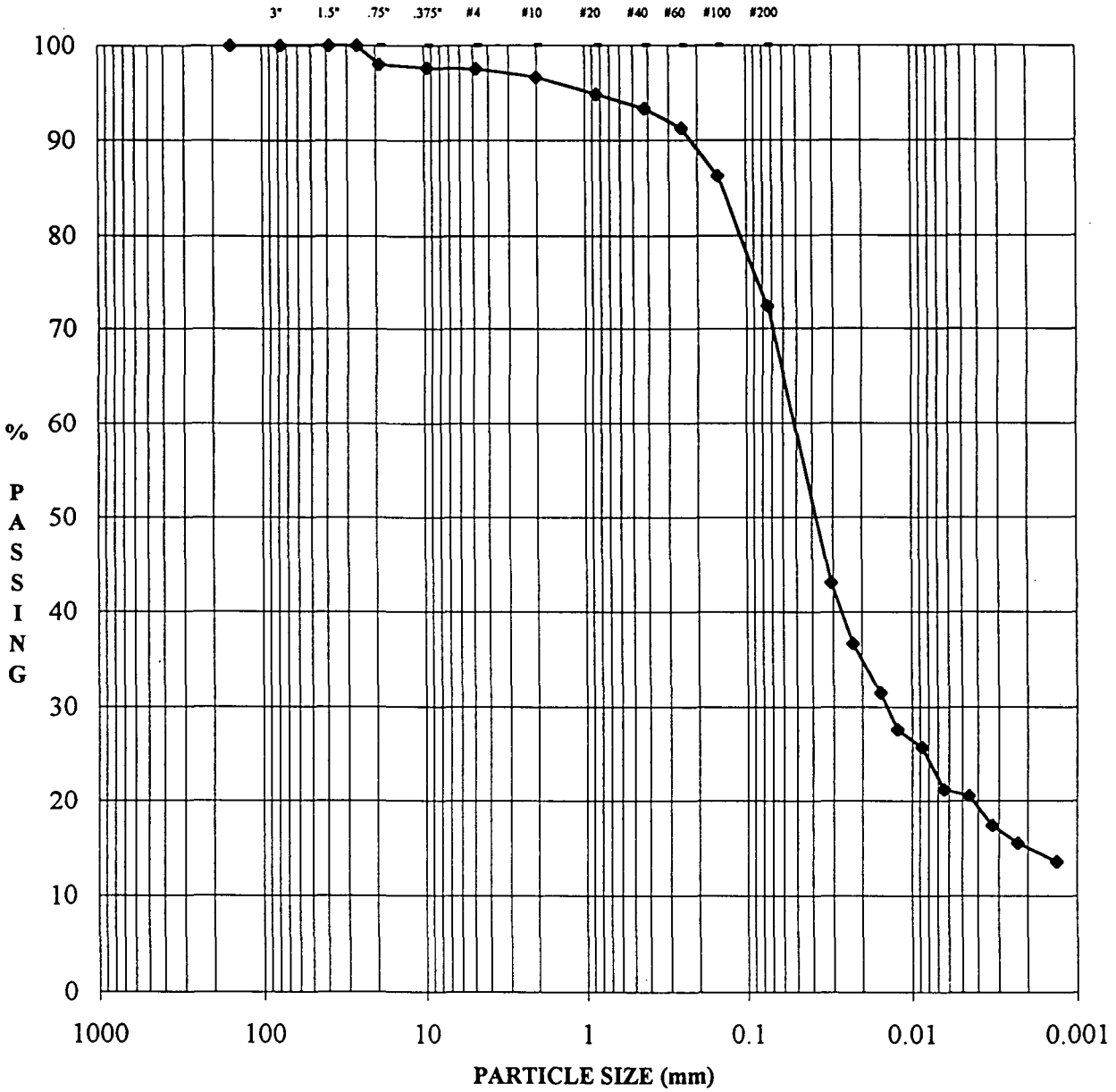
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLE	GRAVEL		SAND			FINES

SAMPLE #:	ST-05	Mc:	31.57%		DATE:	9/17/97
		Gs:	2.65	(ASSUMED)	TECH:	NC/RDD
	PEAT (8.5'-11')	LL:	-		REVIEW:	RMW
WET COLOR:	Light olive brown	PL:	-			
DESCRIPTION:	Fines, some f sand, trace gravel	PI :	-			

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Unconsolidated/Undrained Compressive Strength Test Results

UNCONSOLIDATED/UNDRAINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2850

CARLSTADT PRP/FACILITY COORD/NJ 943-6222.203	SAMPLE #:	ST-03 PEAT 8.5'-11'

SAMPLE DATA

height (in)	6.122	confining pressure (psi)	3.5
diameter (in)	2.847	machine speed (in/min)	0.06
area (in^2)	6.366	strain rate (%/min)	0.98
height/diameter ratio	2.15		
volume (in^3)	38.97	**MOISTURE CONTENT**	
weight (g)	894.23	tare #	6
		wt soil&tare,moist (g)	1241.47
moist density (pcf)	87.37	wt soil&tare,dry (g)	855.41
dry density (pcf)	49.52	wt tare (g)	350.29
		wt moisture (g)	386.06
		wt dry soil (g)	505.12
		% moisture	76.43%

SKETCH

TIME (min)	DEFLECTION (in)	AXIAL LOAD (lbs)	STRAIN (ε)	AREA,CORR (in^2)	DEVIATOR STRESS (psf)	SIGMA 1 (psf)	P (psf)	Q (psf)
0.0	0.00	0.0	0.00%	6.366	0.00	504	504	0
0.5	0.02	4.0	0.33%	6.387	90.19	594.19	549.09	45.09
1.0	0.06	8.0	0.98%	6.429	179.19	683.19	593.59	89.59
1.5	0.08	12.0	1.31%	6.450	267.90	771.90	637.95	133.95
2.0	0.10	15.0	1.63%	6.472	333.76	837.76	670.88	166.88
2.5	0.14	17.0	2.29%	6.515	375.75	879.75	691.88	187.88
3.0	0.18	21.0	2.94%	6.559	461.06	965.06	734.53	230.53
3.5	0.20	22.0	3.27%	6.581	481.39	985.39	744.69	240.69
4.0	0.22	24.0	3.59%	6.603	523.38	1027.38	765.69	261.69
4.5	0.26	25.0	4.25%	6.648	541.49	1045.49	774.74	270.74
5.0	0.28	27.0	4.57%	6.671	582.81	1086.81	795.41	291.41
5.5	0.30	28.0	4.90%	6.694	602.33	1106.33	805.17	301.17
6.0	0.34	29.0	5.55%	6.740	619.56	1123.56	813.78	309.78
6.5	0.38	30.0	6.21%	6.787	636.49	1140.49	822.24	318.24
7.0	0.40	31.0	6.53%	6.811	655.41	1159.41	831.71	327.71
7.5	0.44	32.0	7.19%	6.859	671.82	1175.82	839.91	335.91
8.0	0.46	33.0	7.51%	6.883	690.38	1194.38	849.19	345.19
8.5	0.50	33.0	8.17%	6.932	685.50	1189.50	846.75	342.75
9.0	0.52	34.0	8.49%	6.957	703.76	1207.76	855.88	351.88
9.5	0.56	34.0	9.15%	7.007	698.74	1202.74	853.37	349.37
10.0	0.58	35.0	9.47%	7.032	716.70	1220.70	862.35	358.35
11.0	0.64	35.0	10.45%	7.109	708.94	1212.94	858.47	354.47
12.0	0.70	36.0	11.43%	7.188	721.22	1225.22	864.61	360.61
13.0	0.76	36.0	12.41%	7.268	713.24	1217.24	860.62	356.62
14.0	0.86	36.0	14.05%	7.406	699.93	1203.93	853.97	349.97
15.0	0.88	37.0	14.37%	7.435	716.64	1220.64	862.32	358.32
16.0	0.94	37.0	15.35%	7.521	708.44	1212.44	858.22	354.22
17.0	0.98	37.0	16.01%	7.579	702.97	1206.97	855.49	351.49
					SIGMA 1 AT FAILURE:	**1225.22**		

TIME TO FAILURE, (min):	**12.00**	DATE	9/11/97
DEFLECTION AT FAILURE, (in):	**0.70**	TECH	JMP
STRAIN AT FAILURE:	**11.43%**	REVIEW	RMW

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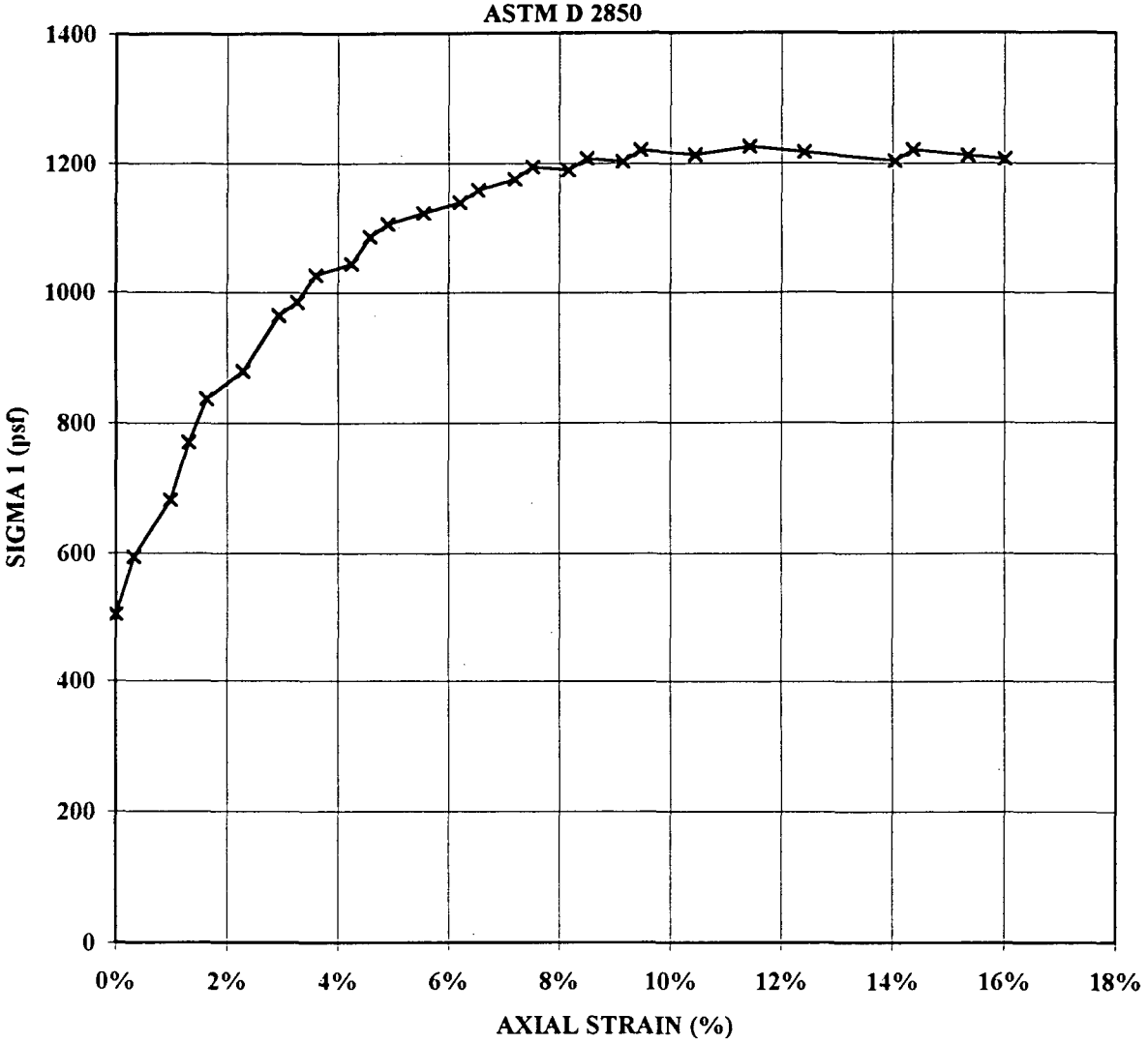
UNCONSOLIDATED/UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



SAMPLE #:	ST-03 PEAT	CONFINING PRES(psi)	3.5
	8.5'-11'	MOIST DENSITY(pcf)	87.37
DESCRIPTION:		% MOISTURE	76.43%
		STRAIN RATE(%/min)	0.98

DATE	9/11/97
TECH	JMP
REVIEW	RMW

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943-6222.203

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UNCONSOLIDATED/UNDRAINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2850

CARLSTADT PRP/FACILITY COORD/NJ
943-6222.203

SAMPLE #: ST-04 CLAY 12.5'-15'

SAMPLE DATA

height (in)	6.228	confining pressure (psi)	4.2
diameter (in)	2.859	machine speed (in/min)	0.06
area (in^2)	6.420	strain rate (%/min)	0.96
height/diameter ratio	2.18		
volume (in^3)	39.98	MOISTURE CONTENT	
weight (g)	1290.01	tare #	7
		wt soil&tare,moist (g)	1652.11
moist density (pcf)	122.86	wt soil&tare,dry (g)	1359.07
dry density (pcf)	95.02	wt tare (g)	359.11
		wt moisture (g)	293.04
		wt dry soil (g)	999.96
		% moisture	29.31%

SKETCH

TIME (min)	DEFLECTION (in)	AXIAL LOAD (lbs)	STRAIN (ε)	AREA,CORR (in^2)	DEVIATOR STRESS (psf)	SIGMA 1 (psf)	P (psf)	Q (psf)
0.0	0.00	0.0	0.00%	6.420	0.00	604.8	604.8	0
0.5	0.04	37.0	0.64%	6.461	824.61	1429.41	1017.10	412.30
1.0	0.06	67.0	0.96%	6.482	1488.38	2093.18	1348.99	744.19
1.5	0.08	95.0	1.28%	6.503	2103.55	2708.35	1656.58	1051.78
2.0	0.12	128.0	1.93%	6.546	2815.82	3420.62	2012.71	1407.91
2.5	0.14	156.0	2.25%	6.567	3420.54	4025.34	2315.07	1710.27
3.0	0.18	172.0	2.89%	6.611	3746.59	4351.39	2478.09	1873.29
3.5	0.22	182.0	3.53%	6.655	3938.19	4542.99	2573.90	1969.10
4.0	0.24	187.0	3.85%	6.677	4032.92	4637.72	2621.26	2016.46
4.5	0.28	189.0	4.50%	6.722	4048.82	4653.62	2629.21	2024.41
5.0	0.30	187.0	4.82%	6.745	3992.51	4597.31	2601.05	1996.25
5.5	0.34	185.0	5.46%	6.790	3923.15	4527.95	2566.38	1961.58
6.0	0.36	181.0	5.78%	6.814	3825.29	4430.09	2517.45	1912.65
6.5	0.38	178.0	6.10%	6.837	3749.07	4353.87	2479.33	1874.53
7.0	0.40	175.0	6.42%	6.860	3673.27	4278.07	2441.44	1836.64
7.5	0.44	172.0	7.06%	6.908	3585.52	4190.32	2397.56	1792.76
8.0	0.48	170.0	7.71%	6.956	3519.34	4124.14	2364.47	1759.67
8.5	0.52	166.0	8.35%	7.005	3412.62	4017.42	2311.11	1706.31
9.0	0.54	164.0	8.67%	7.029	3359.69	3964.49	2284.64	1679.84
9.5	0.56	162.0	8.99%	7.054	3307.05	3911.85	2258.32	1653.52
10.0	0.60	160.0	9.63%	7.104	3243.17	3847.97	2226.39	1621.59
11.0	0.66	157.0	10.60%	7.181	3148.43	3753.23	2179.02	1574.22
12.0	0.72	152.0	11.56%	7.259	3015.32	3620.12	2112.46	1507.66
13.0	0.78	151.0	12.52%	7.339	2962.85	3567.65	2086.23	1481.43
14.0	0.84	150.0	13.49%	7.421	2910.81	3515.61	2060.21	1455.41
					SIGMA 1 AT FAILURE:	4653.62		

TIME TO FAILURE, (min):	4.50	DATE	9/11/97
DEFLECTION AT FAILURE, (in):	0.28	TECH	JMP
STRAIN AT FAILURE:	4.50%	REVIEW	RMW

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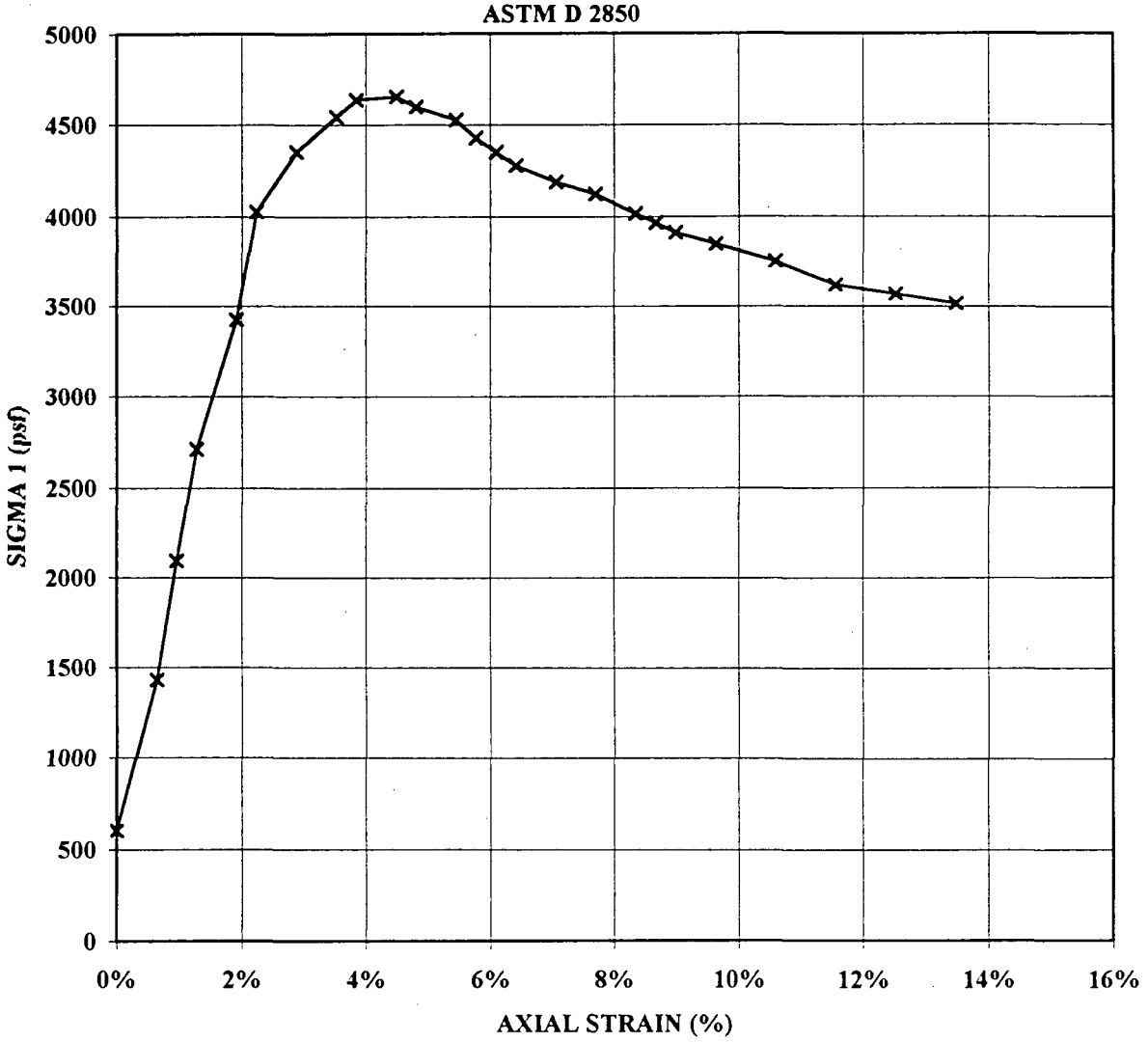
UNCONSOLIDATED/UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



SAMPLE #:	ST-04 CLAY 12.5'-15'	CONFINING PRES(psi)	4.2
		MOIST DENSITY(pcf)	122.86
DESCRIPTION:		% MOISTURE	29.31%
		STRAIN RATE(%/min)	0.96

DATE	9/11/97
TECH	JMP
REVIEW	RMW

CARLSTADT PRP/FACILITY COORD/NJ
943-6222.203

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UNCONSOLIDATED/UNDRAINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2850

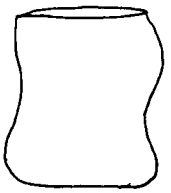
CARLSTADT PRP/FACILITY COORD/NJ
943-6222.203

SAMPLE #: ST-05 PEAT 8.5'-11'

SAMPLE DATA

height (in)	6.030	confining pressure (psi)	3.5
diameter (in)	2.744	machine speed (in/min)	0.06
area (in^2)	5.914	strain rate (%/min)	1.00
height/diameter ratio	2.20		
volume (in^3)	35.66	**MOISTURE CONTENT**	
weight (g)	1134.31	tare #	92
		wt soil&tare,moist (g)	1478.62
moist density (pcf)	121.13	wt soil&tare,dry (g)	1204.86
dry density (pcf)	91.76	wt tare (g)	349.60
		wt moisture (g)	273.76
		wt dry soil (g)	855.26
		% moisture	32.01%

SKETCH



TIME (min)	DEFLECTION (in)	AXIAL LOAD (lbs)	STRAIN (ε)	AREA,CORR (in^2)	DEVIATOR STRESS (psf)	SIGMA 1 (psf)	P (psf)	Q (psf)
0.0	0.00	0.0	0.00%	5.914	0.00	504	504	0
0.5	0.02	6.0	0.33%	5.933	145.62	649.62	576.81	72.81
1.0	0.06	10.0	1.00%	5.973	241.08	745.08	624.54	120.54
1.5	0.08	13.0	1.33%	5.993	312.35	816.35	660.18	156.18
2.0	0.10	16.0	1.66%	6.013	383.14	887.14	695.57	191.57
2.5	0.14	19.0	2.32%	6.054	451.91	955.91	729.96	225.96
3.0	0.16	21.0	2.65%	6.075	497.79	1001.79	752.89	248.89
3.5	0.20	24.0	3.32%	6.117	565.02	1069.02	786.51	282.51
4.0	0.22	26.0	3.65%	6.138	610.01	1114.01	809.00	305.00
4.5	0.24	27.0	3.98%	6.159	631.29	1135.29	819.65	315.65
5.0	0.28	29.0	4.64%	6.202	673.37	1177.37	840.68	336.68
5.5	0.30	31.0	4.98%	6.223	717.30	1221.30	862.65	358.65
6.0	0.34	32.0	5.64%	6.267	735.27	1239.27	871.64	367.64
6.5	0.38	34.0	6.30%	6.311	775.74	1279.74	891.87	387.87
7.0	0.40	35.0	6.63%	6.334	795.73	1299.73	901.86	397.86
7.5	0.44	36.0	7.30%	6.379	812.65	1316.65	910.32	406.32
8.0	0.46	37.0	7.63%	6.402	832.23	1336.23	920.12	416.12
8.5	0.50	38.0	8.29%	6.448	848.59	1352.59	928.29	424.29
9.0	0.52	39.0	8.62%	6.472	867.77	1371.77	937.88	433.88
9.5	0.54	40.0	8.96%	6.495	886.79	1390.79	947.39	443.39
10.0	0.58	41.0	9.62%	6.543	902.33	1406.33	955.17	451.17
11.0	0.64	43.0	10.61%	6.616	935.93	1439.93	971.97	467.97
12.0	0.70	44.0	11.61%	6.690	947.04	1451.04	977.52	473.52
13.0	0.76	45.0	12.60%	6.767	957.66	1461.66	982.83	478.83
14.0	0.82	46.0	13.60%	6.844	967.79	1471.79	987.90	483.90
15.0	0.88	48.0	14.59%	6.924	998.24	1502.24	1003.12	499.12
16.0	0.94	48.0	15.59%	7.006	986.61	1490.61	997.31	493.31
17.0	0.98	49.0	16.25%	7.061	999.25	1503.25	1003.63	499.63
					SIGMA 1 AT FAILURE:	1497.47		

TIME TO FAILURE, (min):	15.41	DATE	9/11/97
DEFLECTION AT FAILURE, (in):	0.90	TECH	JMP
STRAIN AT FAILURE:	15.00%	REVIEW	RMW

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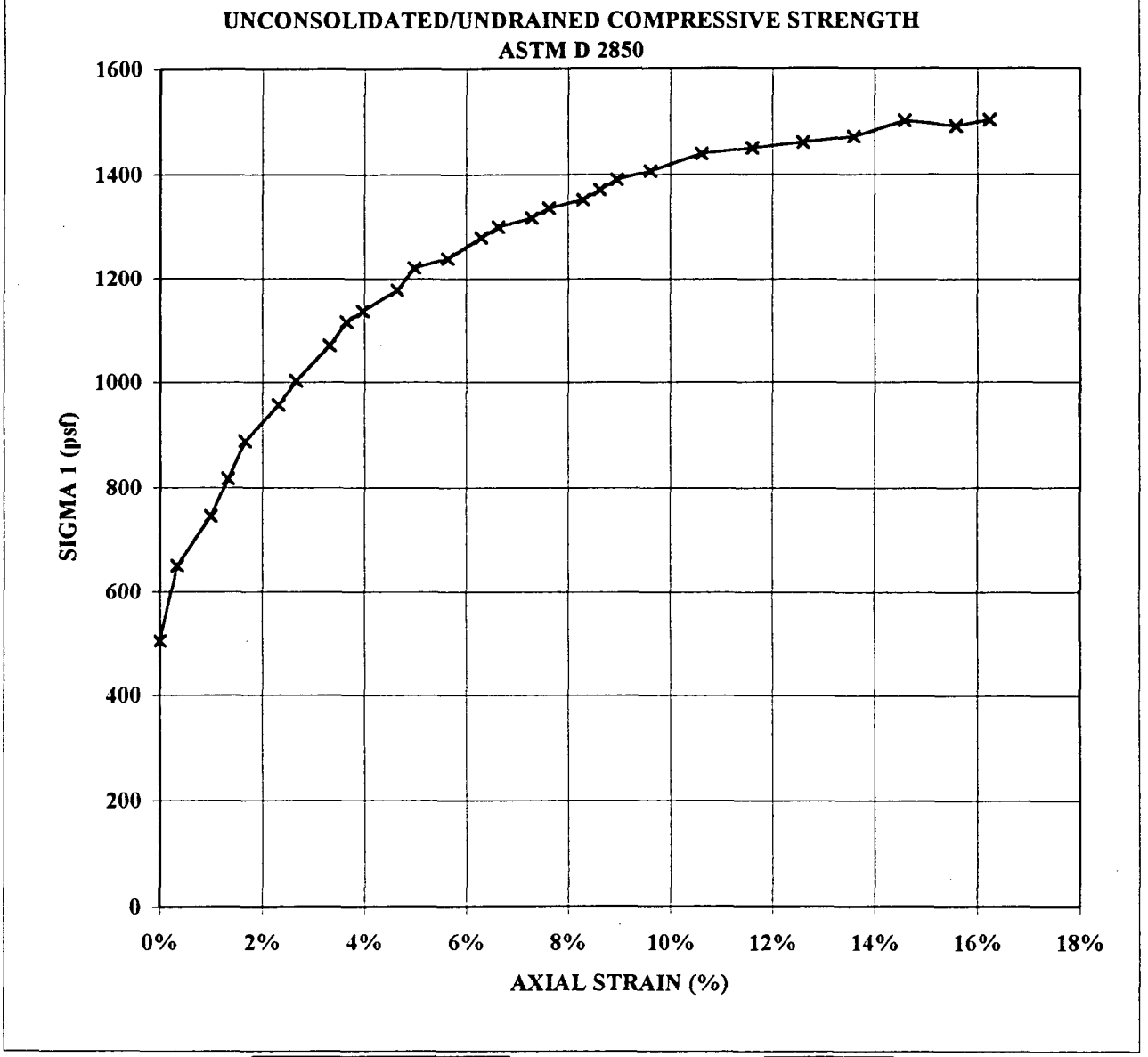

SAMPLE #:	ST-05 PEAT 8.5'-11'	CONFINING PRES(psi)	3.5
		MOIST DENSITY(pcf)	121.13
DESCRIPTION:		% MOISTURE	32.01%
		STRAIN RATE(%/min)	1.00

Failure based upon 15% strain.

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943-6222.203

DATE	9/11/97
TECH	JMP
REVIEW	RMW

GOLDER ASSOCIATES INC.
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Cut Slope Stability Analysis

Golder Associates

SUBJECT	Cut Slope Stability Analyses		
Job No. 943-6222 Ref.	Made by RStettler Checked [illegible] 11/21/97 Reviewed RE	Date 10/16/97 Sheet 1 of 8	

REQUIRED: Examine field and laboratory geotechnical data collected during focused feasibility study at Plank Road Superfund site to refine previous calculations on proximity of excavations to slurry wall to remove grease contamination without damaging wall.

PROCEDURE: Revise assumed parameters used in previous open-cut stability analyses to determine maximum steepness of slope that will be stable without failure.

Examine 2 cases — 1) Infinite slope stability in cut in fill below water table (without dewatering and with dewatering)
2) Base failure of soft organic silt peat layer beneath fill from which laboratory shear strength values were obtained

REFERENCES: 1) Engineering and Design — Stability of Earth and Rock-Fill Dams EM-1110-2-1902 April 1970 - Appendix IV - Simplified Procedures for Preliminary Determination of Embankment Slopes; Appendix V - Infinite Slope Analysis for Cohesionless Soils)

2) NAVFAC DM 7.1 - May 1982 pp 318-324

Cross-Section Analyzed - Fou Fill within slurry wall - Simplifications

Top of ground surface at slurry wall and within 40 ft of wall - EL 7 max
Water table at EL 3 based on wells in area

- $\phi = 30°$ - assumed for unengineered fill based on loose condition - Elevated blow counts measured in the fill only occurred on obstructions - sludge and other matrix materials exhibited low blow counts

- S_u = 350 psf based on UU test results of peat for ST-03 — Peat Layer thickness = 3' based on numerous borings in area

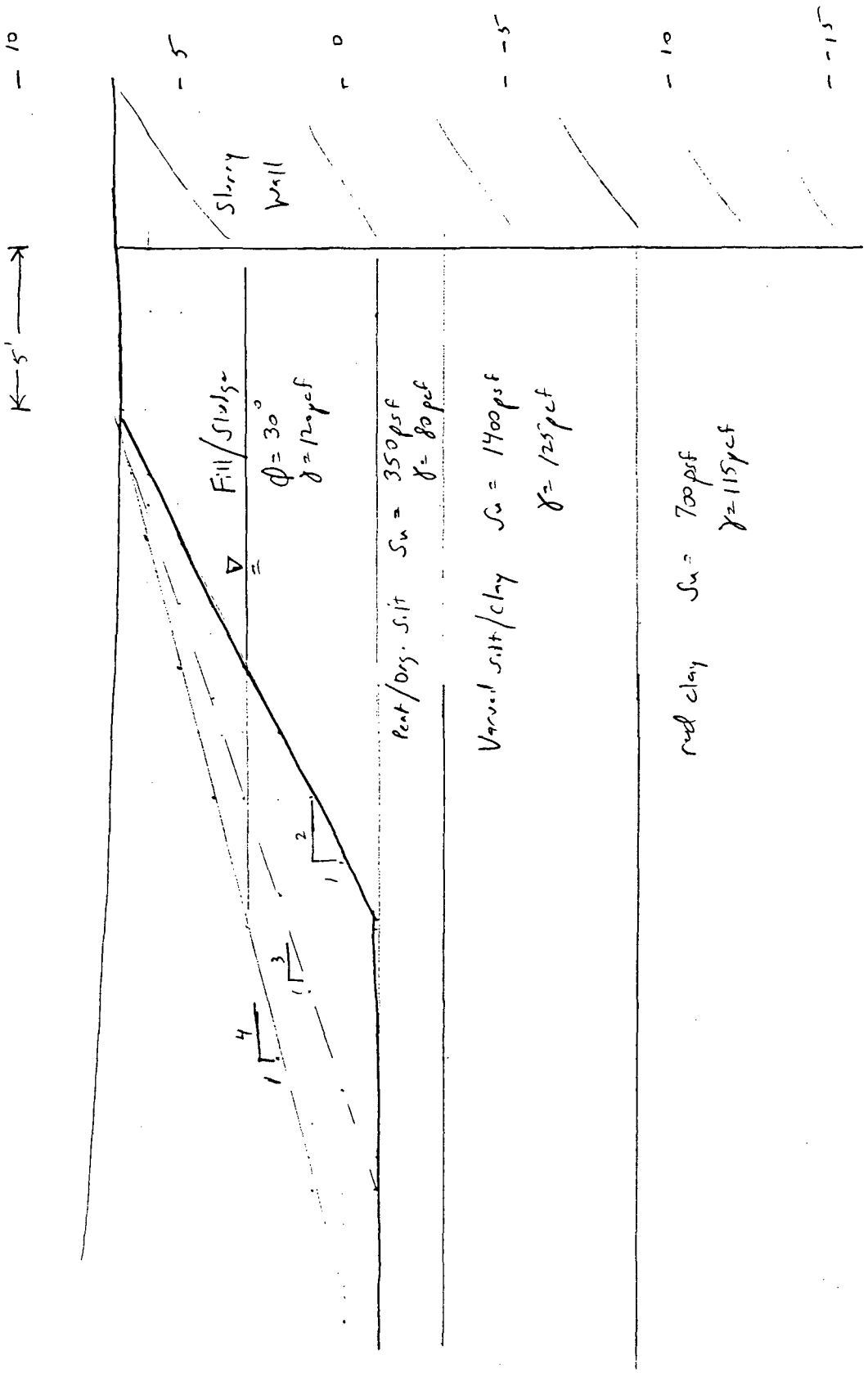
- Peat underlain by varved silt silty sand and silty clay. Thickness of layer = 6' based on Canonie Environmental Interim Remedy Design report (7/91) Samples ST05 (silt) and ST04 (clay) were from the stratum - use ST04 (less disturbed) for strength - S_u = 2000 psf peak, 1400 psf at 15% strain - use lower strength - also consistent with Canonie results - see Table 1 attached

- Silty clay (varved) underlain by red clay below depth 16' — use Canonie data - S_u = 700 psf

101346

Golder Associates

SUBJECT: Cut Slope Stability Analysis			
Job No. 943-6222 Ref.	Made by R Smith Checked Engr Reviewed KL	Date 10/16/97 Sheet 2 of 8	



Golder Associates

SUBJECT	Cut Slope Stability Analyses		
Job No. Ref. 947-6222	Made by [illegible]	Date 10/16/97	
	Checked Zagg	Sheet 3 of 8	
	Reviewed KJ		

Examine cut slope stability

INFINITE SLOPE CASE – horizontal seepage

From Reference 1, Appendix V

$$F.S. = \frac{\gamma' - \frac{\gamma_w}{\cot^2\beta}}{\gamma_{sat}} (\cot\beta \tan\phi)$$

β = angle of inclination of embankment slope :
γ' = submerged unit
γ_w = unit weight of water
γ_{sat} = saturated unit weight
ϕ = angle of internal friction

For 4H:1V slope in Fill

$$F.S. = \frac{(120 - 62.4)_{pcf} - \frac{62.4\,pcf}{(4)^2}}{120\,pcf} (4)(\tan 30^\circ)$$

$$= \frac{57.6 - 3.9}{120} [4][0.58] \quad \checkmark$$

$$= 1.03 \quad \checkmark$$

∴ If don't control seepage, 4H:1V slope not adequate –

For 4.5H:1V

$$F.S. = \frac{(120 - 62.4) - \frac{62.4}{(4.5)^2}}{120} (4.5)(\tan 30^\circ)$$

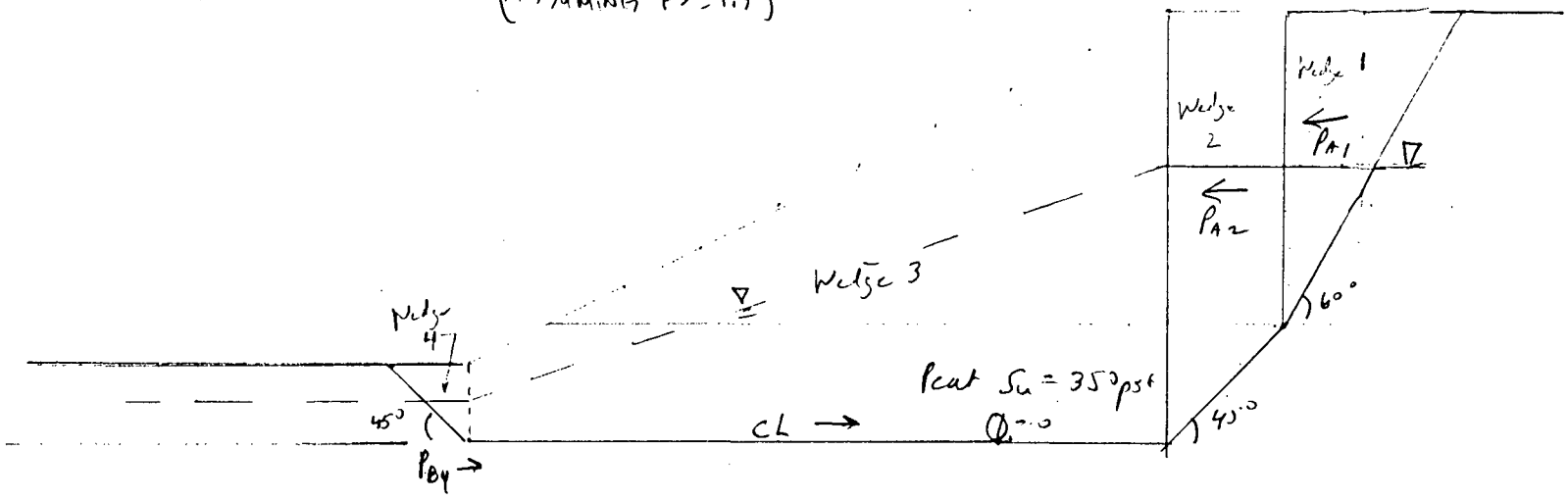
F.S. = 1.18 – barely acceptable – need 5' set back to protect against water erosion flowing down cut slope ✓

101348

Golder Associates

SUBJECT	Cut Slope Stability Analyses
Job No.	912-6227
Ref.	
Made by	
Checked	Zarger
Reviewed	Pitt
Date	12/13/12
Sheet	4 of 8

Analyze translational wedge failure in soft organic silt/peat below fill using method in Ref. 2 (Assuming FS = 1.5)



Active forces Wedge 1

Soil Weight 1 = $\frac{1}{2}(8')\,8(\tan 30°)\,(120\,pcf) = 2.22\,k/ft = W$

with flow = $\left[\frac{0+6}{2}\right] 4.6'\,(62.4\,pcf) = .86\,k/ft = P_W$

$$P_{active} = \left(W - P_W \cos 60°\right) \frac{\left(\tan 60° - \frac{\tan 30°}{1.5}\right)}{1 + \tan 60°\left(\frac{\tan 30°}{1.5}\right)} + P_W \sin 60°$$

$$= \left(2.22k - 0.86(0.50)\right)\left[\frac{1.347}{1.67}\right] + (0.86)(0.87)$$

$$= 2.19\,k/ft$$

101349

Golder Associates	SUBJECT Cut Slope Stability Analysis		
	Job No. Ref. 947-6222	Made by RKS Checked MRE Reviewed P.E.	Date 12/1/09 Sheet 5 of 8

$P_{wedge\ 2} = (8)(3)(120\,pcf) + \frac{1}{2}(3)(3)(80) = 3.24\ kips$

$P_{active} = (3.24k)(\tan 45°) - \dfrac{\dfrac{350\,psf\,(3k(1.414))}{1.5}}{\cos 45°}$

$= 3.24 - 1.40$

$= 1.84\ kips$

$W_{edge\ 3} - N\tan\alpha - \dfrac{350(18)}{1.5}$

$\alpha = 0$ for horizontal

$P_{ft} = -4.2\ kips$

Wedge 4

$W_{weight} = \frac{1}{2}(2)(2)(80) = 160\,pcf$

$R_{resistance} = 160(\tan 45°) + \dfrac{\dfrac{350\,(2)(1.414)}{1.5}}{\cos 45°}$

$160 + 933$

$= 1.09\ kips$

Total driving $= 4.03\ kips$

Total resisting $= 5.29\ kips$ $\quad F_{net} = -1.26$

$\therefore$ F.S. > 1.5 for downhill case

Golder Associates

SUBJECT	Cut Slope Stability Analyses		
Job No. Ref. 943-6222	Made by PAS	Checked ZWEE	Reviewed PSL	Date 12/16/97 Sheet 6 of 8

Try F.S = 1.7

$$P_{wedge\ 1} = \left[2.22 \cdot 84 (0.50)\right]\left[\frac{1.392}{1.588}\right] + 0.86(0.87)$$

$$= 2.31 \text{ kips}$$

$$P_{wedge\ 2} = 3.24 - \frac{\frac{350(3)(1.414)}{1.7}}{\cos 45^\circ}$$

$$= 2.0 \text{ kips}$$

Wedge 3

$$\text{Normal} = \frac{350(18)}{1.7} = -3.71 \text{ kips}$$

Wedge 4

$$160(\tan 45^\circ) + \frac{\frac{(350)(2)(1.414)}{1.7}}{\cos 45^\circ}$$

$$= 0.98 \text{ kips}$$

$$\text{Total} = 2.31 + 2.0 - 3.71 - 0.98$$

$$\text{Net} = -0.38$$

$\therefore FS > 1.7$

Peat is not critical factor - Infinite slope/shallow failure in full saturated duration - can be OK in 2H:1V Cases

TABLE 1
GEOTECHNICAL TESTING PROGRAM RESULTS

Strata	Boring	Sample Number	Depth Interval (feet)	Sample Type	Laboratory USCS Classification	%<#200 Mesh Sieve	Hydrometer (%<2u)	Permeability (cm/sec)	Water Content (%)	Density (pcf)	Atterberg Limits Plastic Limit (%)	Atterberg Limits Liquid Limit (%)	Specific Gravity	Unconfined Compressive Strength (psf)	Compression Index
Peat	B-3	3	4 to 6	Shelby Tube	PT				252.3	75.2					
	B-17	3	4 to 6	Shelby Tube	PT				177.4	76.1			2.24		0.26
Gray Silt	B-4	6	10 to 12	Shelby Tube	ML	99.4	10	2.4 x 10(-6)	26.8	126.5	23	27	2.74		
	B-6	6	10 to 12	Jar	ML	91.9			23.1		22	25			
	B-9	6	10 to 12	Jar	CL - ML	92.1	15		20.5		21	25	2.71		
	B-13	6	10 to 12	Jar	CL - ML	93.0	13		23.3		20	25	2.72		
	B-17	6	10 to 12	Shelby Tube	CL	97.8	33		28.7	121.0	23	41	2.77	4,781	0.035
Varved Clay and Red Clay	B-1	9	16 to 18	Shelby Tube	CL	98.8	45	4.9 x 10(-8)	38.9	116.1	22	42	2.80	1,282	
	B-11	9	16 to 18	Jar	CL - CH	99.7			42.9		24	50			
	B-14	9	14 to 16	Shelby Tube	CH	92.0	57		43.3	119.8	25	53	2.78	1,238	
	B-15	9	14 to 16	Shelby Tube	CL	99.5	55	3.8 x 10(-8)	40.6	119.9	23	47	2.77		
	B-17	9	16 to 18	Shelby Tube	CL	98.8	54	7.6 x 10(-8)	44.1	113.5	23	44	2.77	706	
Till	B-8	10	18 to 20	Shelby Tube	CL	55.8	15		16.4		15	25	2.74		

Notes:

1. Laboratory data and plots, including sieve analysis plots, are enclosed in Appendix B.

2. Some results listed represent average of two or more test results from the same sample.

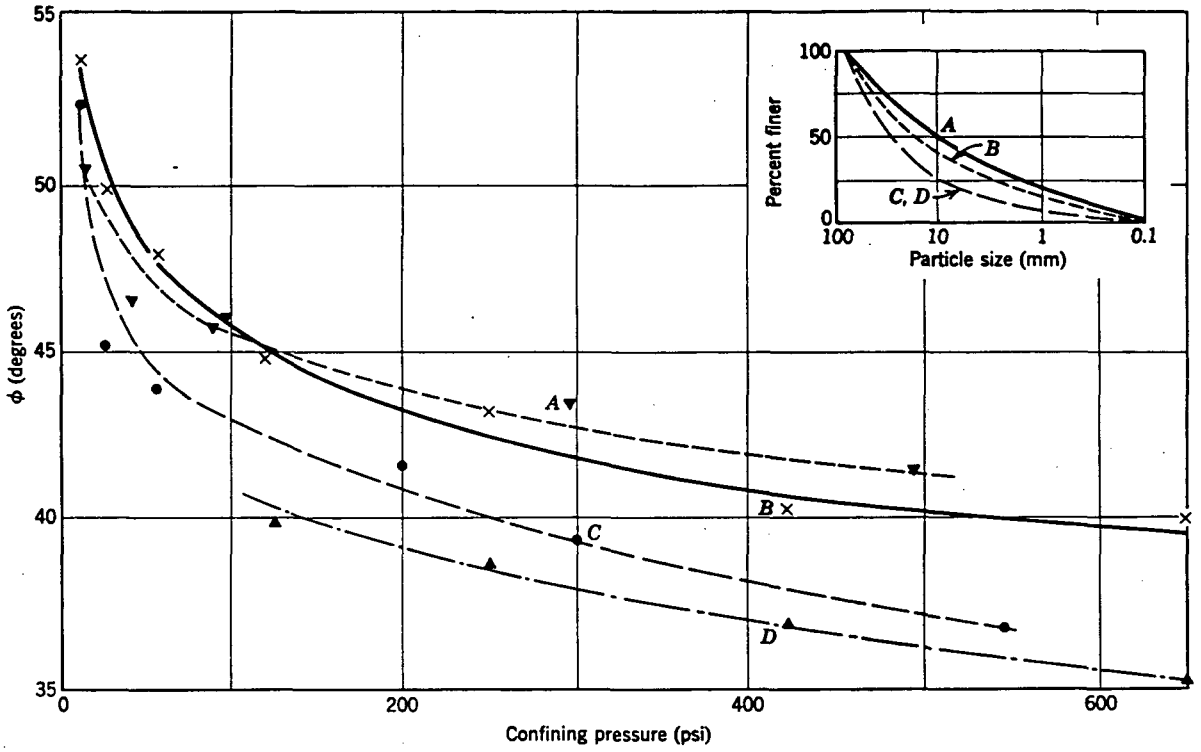


Fig. 11.13 Friction angle versus confining pressure (data from Leslie 1963).

friction angle. The smaller value of ϕ_μ for mica compared to that of quartz has relatively little to do with this result.

Tests (Horn and Deere, 1962) have been carried out using powdered mica with care taken to have the mica flakes oriented nearly parallel. The result was a friction angle (ϕ_{cv}) of 16°, compared to $\phi_\mu = 13\frac{1}{2}°$. There is some small amount of interlocking in such a case.

Where particles of gravel are an important constituent of soil, the origin of the gravel particles can have an important effect. If the gravel particles are relatively soft, crushing of these particles will minimize the interlocking effect and decrease the friction angle as compared to a comparable soil with hard gravel particles.

Summary

The composition of a granular soil can have an important influence upon its friction angle, indirectly by influencing e_0 and directly by influencing the amount of interlocking that occurs for a given e_0. Table 11.3 provides a summary of data that can be used for preliminary design. However, for final design of an embankment, the actual soil should be tested using the void ratio and stress system that will exist in the field.

11.5 DETERMINATION OF *IN SITU* FRICTION ANGLE

The results presented in the foregoing sections have emphasized the predominant role of the degree of interlocking upon magnitude of the friction angle. Thus, i we wish to determine the friction angle of a sand *in situ* it is not enough to find the nature and shape of th particles composing the sand. It is essential to know hov tightly together these particles are packed in their natura state.

It is extremely difficult to obtain samples of a san without changing the porosity. Thus, except fo

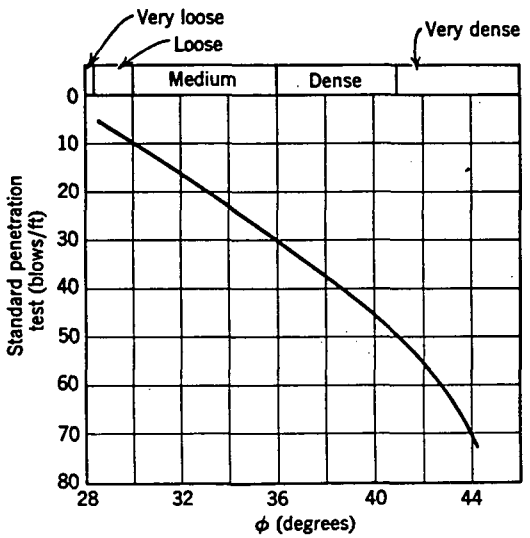


Fig. 11.14 Correlation between friction angle and penetr tion resistance (From Peck, Hanson, and Thornburn, 1953